AUGUST 1993
Issue #373

73 Amateur Radio

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CAN $3.95
A WGE Publication

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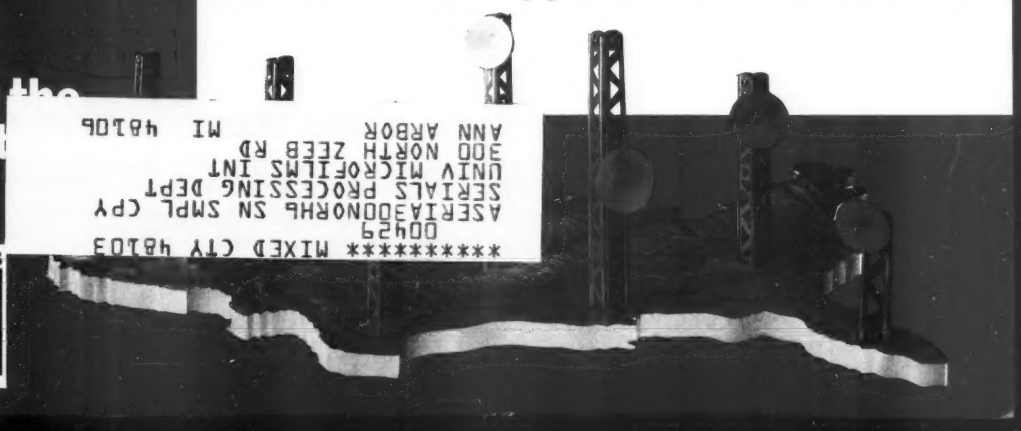

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- **General Coverage Receiver**
- **HM-12 Scanning Mic Included**
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- **105dB Dynamic Range**
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The IC-735 is a heavyweight when you compare features and performance. Other transceivers may weigh more than the advanced IC-735 compact HF transceiver, but inch-for-inch and pound-for-pound, the IC-735 outweighs them all.

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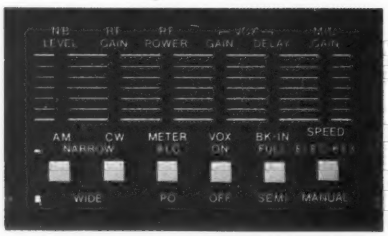

More Features. FM built-in, HM-12 scanning mic, program scan, mode scan and memory scan. Switchable AGC, automatic SSB selection by band and RF speech processor. Continuously adjustable output power up to 100 watts, 12V operation, 100% duty cycle and deep tunable notch filter.

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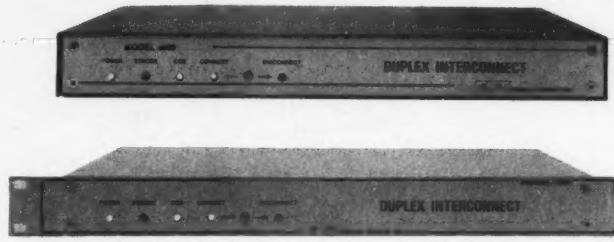
All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 7351086

MODEL 8000 DUPLEX



- Desk top or rack mounted versions
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- Half duplex privacy mode
- Internally squelched audio
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28 dip switches make all features user programmable and selectable.

OPTIONS

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8002 1000 call two tone signalling
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8004 FCC registered coupler
8005 Centralized computer billing system

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- Digital "fast VOX"
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- And much more

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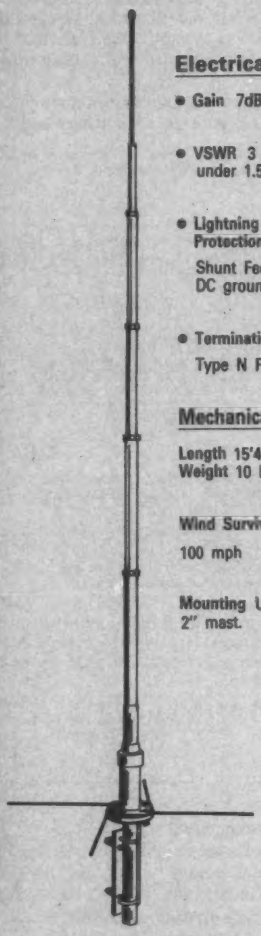
G7 - 144



Electrical

- Gain 7dBd
- VSWR 3 MHz under 1.5:1
- Lightning Protection
  Shunt Fed - DC ground
- Termination
  Type N Female

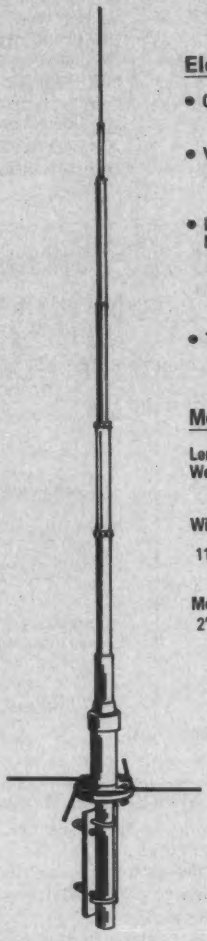
Mechanical

Length 15'4"
Weight 10 lbs.

Wind Survival
100 mph

Mounting Up to 2" mast.

G7 - 220



Electrical

- Gain 7dBd
- VSWR 4 MHz under 1.5:1
- Lightning Protection
  Shunt Fed - DC ground
- Termination
  Type N Female

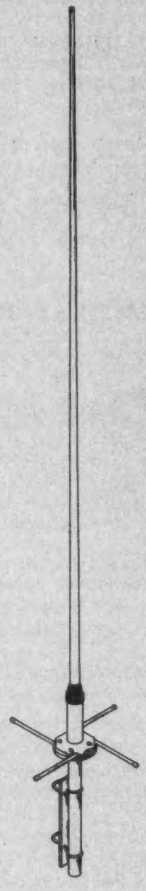
Mechanical

Length 10'2"
Weight 7.0 lbs.

Wind Survival
110 mph

Mounting Up to 2" mast.

G6 - 440



Electrical

- Gain 6dBd
- VSWR 8 MHz under 1.5:1
- Lightning Protection
  Shunt Fed - DC ground
- Termination
  Type N Female

Mechanical

Length 7'3"
Weight 16 lbs.

Wind Survival
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Mounting Up to 2" mast.

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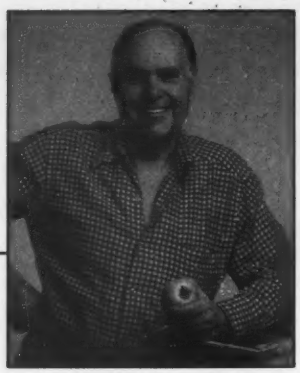

I GET LETTERS

Chris N5IUF wrote in with a beef. It seems, according to Chris, that his good buddy Blaine AL7HH/5 managed to get a repeater channel assigned by the local coordinating committee. Blaine was fresh out of repeaters, so he "loaned" his channel to Dave N5DA and Jim NO5R. Dave and Jim already had one relatively unused repeater on 145.15, but apparently couldn't pass up the prestige of a second on 145.23. I think we'll all agree that two unused repeaters are always better than one.

Blaine and Chris, for some reason which Chris didn't explain—probably because there IS no logical explanation—decided to un-loan the channel. Dave and Jim, as anyone could predict, balked at being evicted, so everyone wrote to the FCC for help. On an intelligence scale from one to ten I'd put that move at around minus twenty-five. First, the FCC has virtually nuked their amateur radio staff. Secondly, we're supposed to be self-policing. Thirdly, why should the FCC (or anyone else) give a fiddler's fluke about a tempest in a teapot in Texas?

Hmmm, Dave and Jim are listed as Extra class in the *Callbook*. Oh-oh. This means, unless they went the Dick Bash way to get their ticket, which eliminated any need to even learn the code at all, that certain key sections of their brains may have been permanently damaged by the code, which often leads to totally unpredictable behavior. Perhaps we can get the *Callbook* to list Bash-Extras separately for us. I'm getting more information on the Novice group in Seattle who are taking up a collection to fund research on Morse code brain repair for Extras.

Someone at Dayton handed me a sample "Asshole Certificate." Oddly enough, it wasn't made out to me! In view of this brouhaha—plus the endless repeater stupidity in Southern California—perhaps it's getting time to start issuing numbered ACs. What do you think?

In this case I'd probably issue number one to Dave and Jim for thinking it's important to have two repeaters on the air. Number two would go to Chris and Blaine for thinking all of this is of any significance when compared with the federal deficit, the trade deficit, acid rain, baby seals, whales, Chernobyl, hunger in Africa, civil war in the Philippines, the loss of our consumer electronic industries, the drug problem, unwed teenage mothers, etc. Number three might go to the Texas FM Society for having rules which make such nonsense almost inevitable.

I gather that the coordinators give an available channel to the group which asks first—with the result that there is a long waiting list. Since the general tendency is for one-ham, one-repeater, I suspect the list could be monumental.

Might I semi-respectfully suggest the FM Society get their act together and rewrite the rules? How about setting up a panel of the presidents of the member repeater groups being coordinated. Any requests for a new channel or any controversies over a channel would be brought before the panel, with the litigants presenting their cases and the panel deciding.

Since all the available channels were assigned long ago, perhaps it's almost time to approach the situation practically and set up a study of the actual use of the channels. A group should have to show actual use of their channel in order to hold it—seems to me. I've visited the DFW area enough to know the actual use is around 0.03% or so. I've gone from channel to channel, calling plaintively for anyone to please talk to me. Silence. I've occasionally managed to stumble on some channels with someone there—and had nice contacts—but most seem completely deserted. Ghost repeaters?

Continued on page 10

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

QRM

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• **Digital Channel Link (DCL) option.**

*Please check FCC regulations on repeater operation.
**Mag mount is not Kenwood supplied
Minor modification necessary for repeater operation.
Specifications and prices subject to change without notice or obligation.
Complete service manuals are available for all Kenwood transceivers and most accessories.

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QRX . . .

EDITED BY BRYAN HASTINGS KA1HY

Code, not Crack!

OVER 200 MEMBERS of the **Radio Club of Junior High School 22** participated in a "Get High on Life" parade in the lower East Side of Manhattan on June 1st, to show just how they go about getting their high. Chanting "code, not crack" and praising "RST" over LSD, the crew was joined by several thousand other marchers representing civic and religious groups, all determined to rid the neighborhood of the drug menace.

The "crew at 22" uses ham radio daily to aid their education. The students are learning CSL (Code as a Second Language), and operate the daily Classroom net on 7.238 MHz at 1100 UTC, where they make an average of several hundred contacts a week. Through amateur radio, these students have a chance to learn about the world; the possibilities away from the lower East Side.

The Radio Club at JHS 22 is funded and assisted by the "Education through Communication" program, which is also involved in implementing the program in other schools around the country. This program is endorsed by such notables as President Reagan and Mayor Ed Koch, and by thousands of hams worldwide.

The parade was a huge success, and will likely become a regular springtime event on the lower East Side. The "Crew at 22" is proud to be a part of the effort to say NO to drugs, and to get their high with a mike or key, some wire and a rig. They know their friends are waiting.

The "Crew at 22" in the Get High on Life *parade in Manhattan.*

Mouth Mobile

SEVERAL YEARS AGO, there was an article in the medicine section of *Time* on the subject of medical detective work. One of the examples cited involved a man who went to a psychaitrist complaining that he was hearing radio broadcasts. Thinking to humor him, the psychiatrist asked what he was hearing right then. The man replied that he was hearing Rudy Vallee from the Steel Pier in Atlantic City. The psychiatrist turned on his radio and, sure enough, heard Rudy Vallee!

After much questioning, the psychiatrist discovered that the man worked in a glass bottle factory and had gotten some of the silica crystals in his dental cavities. The combination of the silica, saliva, and some bridgework in his mouth had literally transformed him into a walking crystal-radio receiver!

The psychiatrist referred the patient to a dentist, who filled the cavities and gave the man's teeth and bridgework a good cleaning. The patient "went off the air", was able to concentrate, and lived happily ever after.

Pan American Games

THE INDIANA SECTION OF THE ARRL will be assisting the **Tenth Pan American Games** in Indianapolis in August. Their two main functions will be to coordinate communications for operational activities associated with the games, and to handle traffic for the atheletes who will be coming from 38 of the Pan American countries.

Nearly 200 Amateur volunteers are needed to assist in the operational events, as well as for the Official Pan American Games Station (W9PAX), the Athletes' Village Station (W9JP), and the Traffic Outlet (WB9MPV). Anyone interested in voluteering their services should contact Cornelius Head WB9ZQE, 9046 Mercury Dr., Indianapolis IN 46229; (317)-263-5281 or (317)-898-2792.

Bicycling and Amateur Radio

OVER 60 VOLUNTEER HAM RADIO OPERATORS have been recruited to assist in the Transamerica Bicycle Race—an event which began on June 1st and will last approx. 5 1/2 weeks. Over 200 bike trekkers will bicycle from Seattle WA to Atlantic City NJ, to benefit the America Lung Association. The goal is to raise over $1 million to benefit programs in the ALA's three main areas of emphasis; smoking, as the major preventable cause of lung disease; occupational and environmental health; and the fight against specific lung disease. ICOM America, Inc. has provided all the necessary communications equipment for the event.

Lazy VECs?

THE FCC HAS DECERTIFIED four more Volunteer Examination Coordinators. The latest to lose their right to coordinate amateur radio testing are: the Adirondack Amateur Radio Club VEC in New York, The Mark 4 VEC in North Carolina, the Dunedin VEC in Florida, and the director of MARS VEC located in Puerto Rico. According to the Commission, all of these VECs were decertified due either to their documented inactivity in testing, or their failure to provide the FCC with the required annual cost recoupment certification. To date, six of the original 27 VECs have been decertified, and *four* of the remaining 21 account for 85% of all ham exams given. These four VEC groups are: the ARRL, W5YI, Central Alabama, and Illinois-based De Vry Technical Institute ARC.

Hemisphere-wide Reciprocity Agreements

KOWALSKI WENT TO MEXICO CITY in May to conclude arrangements on the Inter-American Amateur Operation Convention. There has been much interest in setting up reciprocity agreements between North, Central, and South American countries ever since the Mexico City earthquake several years ago, where amateur emergency communications were hampered due to lack of reciprocity agree-

ments with Mexico. Kowalski states that "the final document on this issue will be forwarded to CITEL (the Spanish acronym for Inter-American Telecommunications Conference)—which meets every four years.

Sometime after August, this document should be open for signature by the administrations in this hemisphere."

Keen On Kemp

THE CENTRAL CONNECTICUT STATE UNIVERSITY Alumni Association has awarded **Peter Kemp** the Outstanding Teacher Award Citation for 1986-87. Besides distinguishing himself in teaching the Technical Arts at the Bethel Middle School, Peter established one of the country's first amateur radio societies, BEARS (Bethel Educational Amateur Radio Society). Many of Pete's students were involved in BEARS, and were part of the communications network during the 1986 Mexican earthquake, Hurricane Gloria, and numerous space shuttle missions.

Peter uses amateur radio to synthesize many subject matters such as geography, math, language arts, current events, and foreign language study. His program is the forerunner of many across the country and he and the program have been the recipient of national recognition.

73 congratulates Pete for making such a vital contribution to amateur radio where it counts most—in the educational system.

To All Mirage/KLM Antenna Users:

MIRAGE/KLM recognizes the numerous comments on the air and in club newsletters about the extremely high VSWR in the following antennas: 2M-11X, 2M-13LBA, 2M-16LBX, 220-14X, and 220-22LBX. They advise that these antennas are very sensitive and require that the attached leads to be as short as possible and balanced. As well, Mirage/KLM has devised a connector, supplied with all new antennas, that will remove any possibility of improper connections. Anyone with one of the above antennas may call Mirage/KLM at 800–538–2140 (outside CA) or 408–779–7363 collect (CA), to have a free connector sent to them.

Is That Country Banned or Not?

THE CRRL IS NO LONGER PUBLISHING the ITU's list of banned countries, due to too-frequent administration policy changes and because officials misinterpret questions on ITU questionnaires and submit incorrect information. No harm is done by trying to work a station from the banned countries list; if the station is truly forbidden to contact you, they will remain silent; if not, you may work a new country!

Just Add Water . . .

THE DAY MAY SOON BE NEAR when applicants who pass the exam will become "Instant Novices", with instant operating privileges. Ray Kowalski, who administers the Amateur Radio Service through his position as Special Services Division Chief, said that he has received so many requests for Instant Novice privileges, that the FCC put this out for preliminary comment as the first step toward proposed rulemaking. Ray also suggested that the call sign of the "Instant Novice" could be the call sign of the person who gave them the examination, plus a prefix.

Kowalski is very interested in finding out how the amateur community feels about this issue. Send your comments (original and five copies) to: FCC, Office of the Secretary, 1919 M St. NW, Washington DC 20554. *Be certain to refer to RM-5924.*

The End

This month's QRX has been compiled with the help of WB2JKJ, Mirage/KLM, *The CRRL News, The Westlink Report, The W5YI Report*, PCARS, and Leonid Yoffe with his teddy bear, Kuizma. Send your news and photos to *73* Magazine, WGE Center, Peterborough NH 03458, Attn:QRX.

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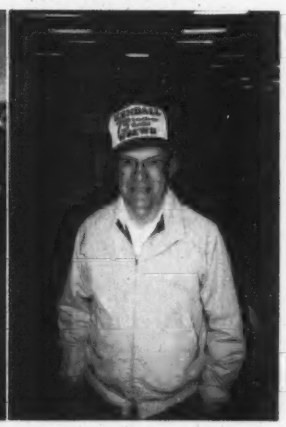

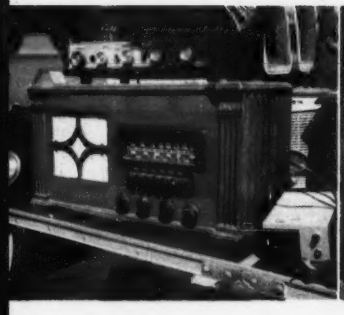

NEVER SAY DIE

from page 4

My suggestion to Chris was first to take up computers as a hobby. Second, I suggested he turn himself in to the mental health authorities as a case of advanced mind rot for even wanting a repeater. Third, I recommended he get the FM Society to change their rules. Fourth, I suggested he try to get Dave and Jim committed to a funny farm for being so out of touch with reality as to think all this is important. Fifth, I suggested Chris and Blaine move to 220 and set up a repeater there for Novices. Then, why not put in a link to the 145.23 input so the Novices could work crossband through any and all repeaters inputting there? How about a 145.83 to 145.15 linking repeater? One more link from 145.75 to 145.23 would lock up Dave and Jim's two repeaters. That's what's wrong nowadays—too little imagination. Of course there might be a problem getting the last two repeaters coordinated—unless there's someone like me on the coordinating commitee, in which case it'd go through in a flash.

Getting back, for a moment, to the concept of use. Here we're really up against it. Once a coordinating committee lets it be known they're checking repeater pairs for use we'll see all sorts of subterfuges—like tape-recorded transmissions and endless IDs. Military shortwave stations often do this in order to prove frequency usage so they can hold their channels. Yet if any attempt is made to determine what actual intelligent use is made of repeaters, our whole house of cards will blow away. I understand there is a tape somewhere which was made of an intelligent conversation over a repeater—allegedly in Georgia—about five years ago. This is probably just another one of those ham myths.

You know...about those certificates...we don't want them used indiscriminately—that would lower their value. Suppose we set up a system where each one is numbered and signed by me. The fox guarding the hen house, so to speak (write). Applications for them would be sent to me, complete with an explanation as to why you think it's warranted. This would allow me to keep track of them and to report the awards. It would also tend to single out repeat offenders for our attention. I'd love to do some articles on legendary ham kooks such as W2OY and W2BIB.

As soon as I have a suitable certificate ready I'll let you know. What's a fair application fee? If we make it free we'll be up to here in applications. How about $5? That should about pay for the work here. We'll let the market decide. If we get too many at $5, we'll up it.

"The last thing any of the participants in a repeater hassle want are creative solutions—they're all looking for allies and a Big Win."

I think I'll go ahead and bring out a nicely decorated Asshole Certificate. A chap on 20m yesterday sure earned one from me. This turkey got his kicks by calling CQ on top of any contact I tried to make—kept this up for about 20 minutes. Lucky for him I'm not an Extra, else I might have taken the first plane to Fredericksburg, Virginia, and done hamdom and his family a big favor. There are enough certificates needed so I suspect I could sell them in pads of a hundred. We'd sure do a land office business in Southern California and New York City.

Yes, I realize that the last thing any of the participants in a repeater hassle want are creative solutions—they're all looking for allies and a Big Win.

SMALL CHANGE

It's almost getting time for some new mode of ham communications, isn't it? We've been using sideband since around 1960, so it should be time for us to think up something new.

I think it was in the early 20s that we went from spark to CW, complete with the usual old-timer reaction of "Spark Forever." We didn't have very many hams at the time, but what few we had spent a good deal of their efforts fighting each other.

Before WWII, about 80% of all ham activity was CW—mostly on 40m, which was a CW band. Everyone was crystal-controlled, so it was normal procedure to call long CQs and then tune the whole band for a call. We had two phone bands of any great importance, 20m and 75m, both 100 kc wide (kHz hadn't yet been invented).

75m was occupied most of the time by nine groups of hams with kilowatts, each taking up 10 kc. These were very elite groups since a kilowatt of AM cost on the order of $50,000 in today's dollarettes. They ignored the plebeian 25-Watt hams. Persistent breakers would be acknowledged once to shut them up, but would never be given an opportunity to make a transmission.

20 meters wasn't much better. This was Class A territory—the land of Big Signals—and, being only 100 kc wide, there was room for about nine and then the band was full. Remember, everyone was crystal-controlled, so there wasn't any way to sneak into an unused spot in the band.

Class B hams—which most of us were—either ditted away on 40m, making contacts as exciting as those today—which means almost totally rubber-stamp contacts—or were adventurous and built a small 160m phone rig—a 6L6 oscillator, modulated by a 6L6, using an F1 mike swiped from a pay telephone.

Class Bers could use 10m, but that was a VHF experimental band—attractive to pioneers, but sneered at by real hams (Class Aers).

By the 50s, the vfo was in common use and war surplus rigs made it so anyone could whup together an AM kilowatt. The private-club phase of hamming was dying.

The expanding of 75m to 200 kc, the opening of 100 kc on 40m to phone, and the expanding of the 20m phone band were brought about by this general move from CW to phone in the 50s—complete with the usual infighting. I think it was W2EE who devoted the last years of his life to jamming 75m DXers trying to

Continued on page 53

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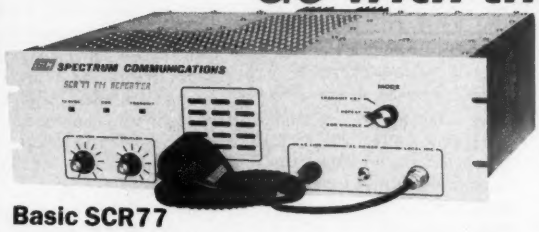

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LETTERS

NOVICE DSB AM

Never before have amateurs gotten so much for so little than with the Novice Enhancement. These new privileges should significantly spur growth on 220 and 1290 MHz since several of the Japanese manufacturers presently have suitable rigs on the dealers' shelves.

Keeping in mind that the 2m FM boom resulted only because of cheap, plentiful, yet obsolete commercial FM radio gear, I think the League and the FCC should reconsider DSB AM on the 28-MHz Novice subband for several reasons.

First, as evidenced by the 10m FM boom, most CB sets readily convert to 10 meters. Their AM mode is obsolete compared to more efficient modes of modulation but the radios are surprisingly state-of-the-art. Novices would be no more handicapped running AM than we were running SSB or FM in the early days of these modes.

Second, many adults I know are hard-pressed to justify $300–$400 for a new FM rig. How many young teens can afford that much? How many more could afford $35 for a secondhand CB set and maybe $20 worth of parts to put it on 28 MHz?

Third, converting the set would give Novices an excellent opportunity for hands-on experience—SSB gear is formidable to work on, even for most higher-class licensees.

On the other hand, maybe the League and the FCC just want Novices to subsidize Japanese research and development, further widening their technological lead over us, and shrinking our technological manpower pool.

Richard Williams WB4FAX
Richmond VA

GLOBAL GOOD

When I look at what Amateur Radio is today compared to what it was in the past, the single word that jumps out at me is *relevance*. The essence of early radio was communication over great distances in what was basically a rural society.

Today's amateur radio seems to be more a vehicle for self-expression than a service in exchange for frequency allocation. It should be redirected more to service to the global community. For example:

The Environment. Canada and the New England states are screaming about acid rain while Washington stonewalls the issue. Radio amateurs in the affected areas could set up a network of rain pH monitors and provide a continuous series of pH contour maps on a scale that no private organization or university could undertake.

Geophysics. As California awaits its next major earthquake, it's clear that there exists an opportunity for amateurs to experiment with laser- and microwave-based rangefinding equipment and help monitor and correlate geophysical data to aid in the prediction of earthquakes.

Developing Countries. Amateurs can make a significant contributions by helping to establish communications links and provide reliable sources of power.

This is the kind of relevant activity that would get me interested in amateur radio.

Ken Robart
North Vancouver BC

10/220 XLINK

Good news! The reception on 220 in this part of the country to Novice Enhancement has been very positive. There has been no great deluge of used gear hitting the market from dissatisfied upperclassmen nor any hazing of the Novices on 220. As a matter of fact, months before Novice Enhancement, there was great discussion on our local repeater, WA7SPR (224.10), as to how we could ease Novices into 220. We decided to provide a code-practice session on the repeater, and Frank WA7SPR provided a cross-band link to the 10-meter Novice SSB subband through the 220 repeater, since not all Novices could justify spending a few hundred bucks to get on 220. Doing Novice code practice right in the middle of the Novice 10-meter SSB band attracted a lot of check-ins from both sides. We were able to discuss what was going on on SSB.

If you hear about any more hams throwing their 220 rigs in the can, let us know. We have a growing number of people here thinking about 220.

Bill Martin N7EU
Bothell WN

ICOM u2AT REVIEW

I was rather surprised to read the positive review of the ICOM micro 2AT in the May issue. I owned one of these units for a couple of days and was extraordinarily disappointed in its performance. Fortunately, the dealer from whom I purchased the unit took it back in exchange for another hand-held (the Yaesu FT-23R).

The biggest problem that it failed to mention the u2AT's most serious fault—that the radio won't scan in the usual sense of the word. That is, there is no way you can set the radio up to automatically step through each memory and stop when it comes to a frequency that is in use. Similarly, there is no way that you can have it scan the band or a portion of the band and have it stop when it comes to a busy frequency. Although advertised as "scan," that function only stepped through frequencies or memories when the button was depressed. This function, better termed "auto-repeat," makes the radio difficult to use, especially in the car.

The *73* review did, however, point out the other drawback of this radio—that it will not store repeater offsets independently in memory.

My only guess as to why these critical functions are missing from an otherwise state-of-the-art rig is that ICOM fears that a full-featured radio will cut into its market for the IC-02AT.

John Hansen WA0PTV
Fredonia NY

OOPS

You sure play fast and loose with figures. In coming up with the number of Soviet radio amateurs (Never Say Die, March, 1987) you must have rounded W5YI's 48,000 up to 50,000 and then dropped the last zero. How could there be 10 to 15 thousand active out of a total of 5,000?

Bob Eldridge VE7BS
Pemberton BC

Right you are . . . we dropped a digit.—Eds.

EMP UPDATE

Wayne Green's editorial remarks (April, 1987) seem to indicate some problem with official "secrecy" surrounding shielding and protection of sensitive solid-state amateur equipment against electromagnetic pulse (EMP) from nuclear blasts. Since this is an important issue for currently active amateurs and future generations, the following information may be helpful.

Technical data regarding relatively simple and attainable protective measures against EMP are available to anyone willing to purchase—or request through inter-library loans—the following publications:

1. Gladstone and Dolan, *The Effects of Nuclear Weapons*, Third Edition.

2. *Electromagnetic Pulse Protection Guidance* (CPG 2-17, January, 1986), available through your local State Civil Defense Office or the Federal Emergency Management Agency.

3. The NCS TIB 85-10 Document, issued by the Technology and Standards Section, National Communications System, Washington DC 20305.

There are other publications addressing this subject, but I think the above-mentioned will give sufficient technical information and guidance to those among us seriously interested in shielding and protecting our communications equipment against EMP from potential nuclear attack or emergency.

Dr. F. Paul Kosbab NF4E
Tulsa OK

WANT ONE?

Since Novices and the Technicians are permitted to use a portion of the ten-meter band, why not sponsor a WANT certificate for working 50 Novices and 50 Technicians on the 10-meter band. It might even increase your subscription list if you offered a free subscription to the first Novice and first Technician to obtain requirements; I suggest no QSLs required.

I want a WANT. Do you want a WANT?

Buzz EggeBrecht W4BE
Port Richey FL

Anybody else out there want a WANT?—Eds.

Catch of the day!

Have you been trawling the bounding main for a new product? We have just netted it—the TP-38 microprocessor controlled community repeater panel which provides the complete interface between the repeater receiver and transmitter. Scuttle individual tone cards, all 38 EIA standard CTCSS tones are included as well as time and hit accumulators, programmable timers, tone translation, and AC power supply at one low price of $595.00. The TP-38 is packed like a can of sardines with features, as a matter of fact the only additional option is a DTMF module for $59.95. This module allows complete offsite remote control of all TP-38 functions, including adding new customers or deleting poor paying ones, over the repeater receiver channel.

$595.00 each
$59.95 DTMF module
$149.95 Digital CTCSS module

Other features include CMOS circuitry for low power consumption, non-volatile memory to retain programming if power loss occurs, immunity to falsing, programmable security code and much more. The TP-38 is backed by our legendary 1 year warranty and is shipped fresh daily. Why not set passage for the abundant waters of Communications Specialists and cast your nets for a TP-38 or other fine catch.

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CIRCLE 10 ON READER SERVICE CARD

NEW PRODUCTS

The new Silver Eagle.

MICROPHONE IMPROVED

The Astatic Corporation, manufacturer of the classic "D104" communications microphone, is introducing a new version of the Silver Eagle. The ETS9-D104SE± is the Silver Eagle plus a new microphone amplifier, switching system, and built-in end-of-transmission signal (ETS).

The ETS is a 1-kHz tone which is heard by both microphone operator and transmission receiver when the microphone is unkeyed. This tone indicates that the transmission is completed. It is generated electronically within the microphone and and is switch selectable.

Additional features include a new VOX switch for transceivers that incorporate this feature, a 20-dB pad on the audio output, and the capability of powering the microphone either from a 9-volt battery or directly from the radio.

For more on the Silver Eagle Plus microphone, circle Reader Service number 210.

TWO NEW ICOM BASE STATION TRANSCEIVERS

ICOM is introducing the IC-575A, a 10m and 6m dual-band base-station transceiver, and the IC-475A, a 440-MHz base station transceiver.

Both radios are all-mode, and have 99 tunable full-function memories, passband tuning, notch filter, noise blanker, built-in SWR bridge, semi or full CW break-in, and a multi-function meter. These transceivers also have velvet-smooth tuning knobs and easy-to-read amber LCD readouts with variable backlight.

Four scanning memories are available: band, programmable, mode and memory scan, with selectable lock-out. 99 memories can be scanned in five seconds. The IC-475A also has a tone squelch unit, speech synthesizer, an OSCAR module that allows tracking with a companion IC-275A or IC-275H, FL-83 500-Hz 10.7491-MHz CW filter and an AG-35 mast-mounted pre-amp.

The new IC-475A, a 440-MHz base station transceiver.

All subaudible tones are built-in and the actual subaudible frequency is displayed. Standard repeater splits are built-in and odd splits are programmable. A DDS (Direct Digital Synthesizer) is also included in the IC-575A for packet enthusiasts. The 10-Watt IC-575A and the 25-Watt IC-475A are similar in design to ICOM's compact base station line: the IC-735, the IC-275A, and the IC-275H.

The IC-475A will be available in May 1987. The suggested retail is $1,999. The IC-575A will be available in June 1987, and the price will be announced.

HEATHKIT MULTI-MODE TNC

Heathkit is introducing their new HK-232 Pack-Kit™ Multi-mode Terminal Node Controller. The Pack-Kit TNC operates on RTTY, lets users run CW at speeds from 5 to 99 wpm and works on AMTOR, ASCII, HF (300 baud), and VHF (1200 or up to 9600 baud with an external modem) Packet. It is also capable of decoding weather facsimile onto an Epson-compatible printer.

Adding the HK-232 to a radio and a computer lets the amateur get on the air in every mode. It connects to the radio's PPT line, speaker output, and microphone input for interchangeable VHF and HF operation. The same connections work for all other modes including CW.

Amateurs can connect both their HF and VHF rigs at the same time, which allows switching between VHF Packet and copying a W1AW RTTY bulletin on 40 meters.

A "Signal" command causes the Pack-Kit to determine the correct RTTY, ASCII, or AMTOR mode for the signal that the amateur is listening to. It also presets baud rate and mode, and will invert the signal if necessary. The HK-232 even handles American Standard Baudot (Western Union), Japanese Katakana Morse, Cyrillic (Russian) Morse and translated versions of Katakana and Cyrillic.

The HK-232 features an eight-pole audio by-pass filter, followed by a limiter discriminator with automatic threshhold correction.

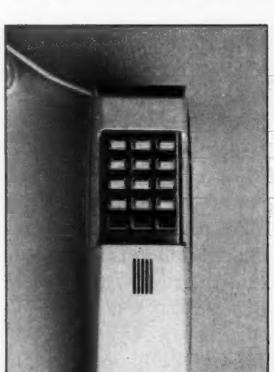
No special software is required to operate the HK-232 Pack-Kit TNC. It can be used with any modem communications package you may already have or an optional program written specifically for the HK-232 and a Heathkit/Zenith PC or PC-compatible computer. It connects to a terminal or computer through a standard RS-232 serial port at baud rates from 300 to 9600.

For more information on this TNC, please circle Reader Service number 201.

NCG HOTLINE-107 HAND SETS

The Hotline-107 Hand Sets was developed in response to requests from both Amateurs and Land Mobile Users.

The 107th featues include: a dynamic 100-Ohm speaker, and adjustable volume control, in-cradle dialing, vertical or horizontal mounting, and noise-cancelling microphone. Features in the 107M include the above, plus: auto-dial with a 10-number memory, a super-capacitor 14-day memory backup, a three-button memory



NCG's Hotline Hand Set.

The MFJ-701 RFI-free Choke kit.

set, and an ANI, installable by the system owner.

These nicely-styled Hand Sets are available through your local dealer or the NCG company. You can get more information on these sets by circling Reader Service number 204.

THE BANKER

Inventron Labs has introduced an exciting new accessory for owners of the Kenwood TS-940S transceiver. The Banker offers front-panel control of the radio's four memory banks, via the "voice" switch. The circuit board installs in the space intended for te voice synthesizer and simply plugs in. No modifications to the radio are necessary.

Pressing the voice switch permits the operator to select any of the four memeory banks, without using the radio's top-mounted bank switch. In fact, the switch need never be used again, so the sliding cover can remianed closed! The Banker cannot be installed if the voice synthesizer unit is already installed.

The Banker utilizes ultra-low-power circuitry, takes no power from the radio's back-up batteries, and is covered by a one-year limited warrenty.

The Banker may be ordered from Inventron Labs for $49.95. More information on this product can be obtained by circling Rader Service number 207.

RFI-FREE CHOKE KIT

MFJ Enterprises, Inc. is introducing its new MFJ-701 RFI-free Choke kit that eliminates RFI (radio frequency interference) problems that affect TVs, radios, stereos, telephones, VCRs, computers, PA systems, burglar and fire alarms, test equipment, modems, monitors, and other electronic devices.

A highly effective solution for eliminating RFI is to wind an offending cable or wire around a ferrite toroid to choke off RFI, but it difficult to find a toroid with the proper characteristics which has a large enough hole to allow passage of an end of a power cord, AC adapter, microphone cord, speaker leads, etc. The toroids in this kit, however, separate into halves, which makes it easy to wind around the toroids nearly any kind of wire or cable, even ribbon cable and coax. The toroid halves mount together in a snap-together plastic frame. The individual toroids can also snap together in a stack, to increase effectiveness for large-diameter wires.

For additional info on this choke kit, please circle Reader Service number 215.

COMMODORE 64/128 TERMINAL PROGRAM

Kantronics is announcing the release of their newest terminal program, the Kanterm 64/128, written for use with the Commodore 64 and 128 computer terminals. The program offers split-screen display, message buffers, disk storage, and type-ahead buffer. The C-128 runs in 128 mode and provides for 80-character lines. Kanterm can be used with most Kantronics "SMART" modems, such as the KPC-1, KPC-2, KPC-4, KPC-2400, KAM, and UTU-XT/(P). Kanterm 64 and 128 come together on one diskette. Suggested retail is $29.95.

For more information on this product, please circle Reader Service number 214.

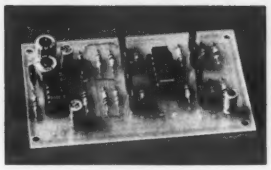
NOVICE VOICE-CLASS "QUICK COURSE"

Gordon West Radio School offers a custom-developed Morse Code and theory course for the beginner amateur radio applicant. Two long-play srereo code cassettes cover learning of the code in a humorous and educational manner, and is designed for students with absolutely no background in code copy. In the fully illustated Novice voice-class license preparation manual, every Novice class question is covered by a thorough explanation and there is a discussion of the right and wrong answers that may be found on the test. The cassettes and book come with a white vinyl carrying case.

Also included in the packet are instructions to the two examiners, a thirty-question sample Novice exam, a five wpm sample code test, a 610 Form to use to apply for the license to the FCC, and a full-color ICOM frequency-band chart.

For more info on the Novice course, circle Reader Service number 208.

The "Quick Course" from Gordon West.



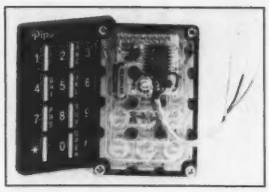
The CW-1 Active Audio Filter from BEL-TEK.

MINIATURIZED DTMF-ENCODERS

Pipo Communications has just developed a new line of Touch Tone Encoders, the P-7 and P-8 series. These encoders are the first of there kind in this industry and have steel keys and sealed gold dome contacts. They are miniaturized and designed to fit most radios. The dimensions of the P-7 12-Key encoder, vertical (P-7V) or horizontal (P-7H), are 2.16″ x 1.5″ x 0.20″. The dimensions of the P-8 16-Key, vertical only (P-V8) are 2.16″ x 1.9″ x 0.20″. This series is available in black or dark brown (to match the Standard Communications HX Series).

These units are available immediately. For more information, please circle Reader Service number 206.

NCG's 900-MHz antenna.



Pipo's P-7 touch-tone encoder.

ACTIVE AUDIO FILTER FROM BEL-TEK

BEL-TEK introduces the CW-1 Active Audio Filter, which eliminates QRM and easily connects between the transceiver and speaker. The CW-1 has three selectable bandwidths of 90, 130, and 200 Hz with a center frequency of 200 Hz. It has a built-in audio amplifier to directly drive a loudspeaker. The kit comes complete with all the parts needed to make the CW-1 functional. The CW-1 measures 2″ x 3.4″ and can be powered by a 9-volt battery. Price: $19.95.

For more information, please circle Reader Service number 213.

NCG 900-MHz ANTENNAS

The 900 MHz antennas are now available and specifically designed for use in the 902/928 MHz band. The mobile antenna uses a magnetic mount with a double coil whip. It is a 15-dB gain antenna capable of a maximum of 30 Watts of power. It is anodized black, and its model number is CMW-202N.

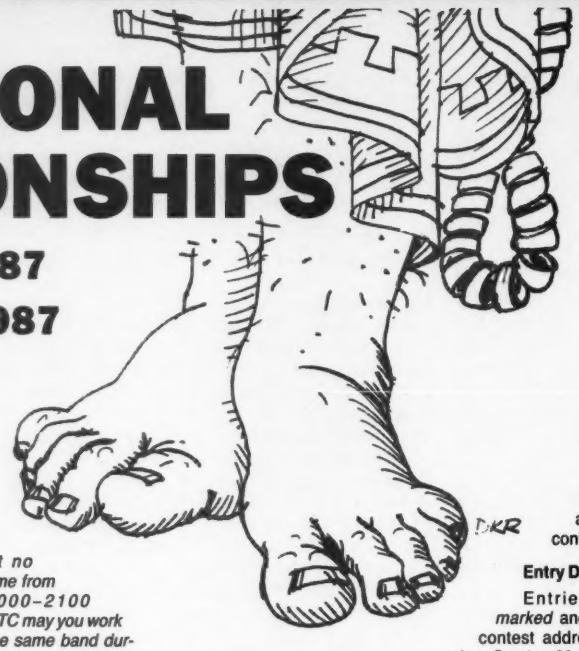
The 900-MHz base/repeater antenna is model number CFC7-71. It it is a collinear fiberglass antenna with a gain of 17.4 dB and maximum power capabilities of 50 Watts. Mast-mounting brackets and hardware included.

These antennas are now available through independent dealers and the NCG company. For more info on these antennas, please circle Reader Service number 205.

THE NATIONAL CHAMPIONSHIPS

CW: September 5, 1987

SSB: September 6, 1987



For the first time ever, the "Little Gun" has a chance to become a National Champion! The National Championships have been designed to recognize the Contest Operator of the Year. Unlike other events, they single out the best Contest Operator in the USA, not just the station with the biggest hardware investment!

There will be a *National Sideband Champion* and a *National CW Champion*. The combination of these two contest scores will determine the *Contest Operator of the Year*.

Contestants, analyze your band plan. *Do not* take these events for granted. They are, without doubt, the most complex stress-testing events on the bands today. If you understand the rules, you'll recognize "traps" strewn in your path. Being lax could spell your doom. Should you work all bands? How do you maintain your QSO rate without sacrificing your multiplier average? Should you be using the monobander? What happens when you switch to 10 or 160 meters for the 10-point QSOs? It's up to you, the *Operator*, to do what's best for you!

EXTERNAL AMPLIFIERS ARE PROHIBITED. Run barefoot (up to 200 Watts maximum exciter output power) or your entry is disqualified.

Contest Dates

The First Annual National CW Championship Contest is at 0000–2400 UTC on September 5, 1987.

The First Annual National SSB Championship Contest is at 0000–2400 UTC on September 6, 1987.

Eligibility

Open to *single-operator stations* within the *50 U.S. States only*. A station must be capable of operating two or more bands; there are no single-band categories. Eligible bands include 10, 15, 20, 40, 75/80, and 160 meters.

Miscellaneous Rules

Stations may operate only *18 hours* of each 24-hour contest. The same station may be worked *once on each band*. For stations submitting a contest entry, *external amplifiers are strictly prohibited*. Exciter output must not exceed 200 Watts.

Mandatory Band Switching

This rule separates the men from the boys. Read it over several times, as it is the toughest rule to interpret. Be sure you understand it! Violators must be disqualified and their entries processed as check logs.

Stations submitting an entry must operate only on a single band during the following time frames: 0000–0300 UTC, 0300–0600 UTC, 0600–0900 UTC, 0900–1200 UTC, 1200–1500 UTC, 1500–1800 UTC, and 1800–2100 UTC. In other words, you must establish a band within a time frame and *cannot* move from that band until the next frame.

At no time from 0000–2100 UTC may you work the same band during two consecutive time frames. At least one time frame must pass before the same band can be worked again. *From 2100–2400 UTC only* may stations switch to any band as often as they like.

Exchange

All stations must transmit RS(T) and U.S. State.

QSO Points

10 QSO points per valid QSO on 10 or 160 meters. 5 QSO points per valid QSO on 15, 20, 40, or 75/80 meters.

Multiplier Points

1 multiplier point for each state worked on 15, 20, 40, or 75/80 meters. 2 multiplier points for each state worked on 10 or 160 meters.

Multiplier Average

Multiplier average is determined by totalling all multiplier points and dividing them by the number of bands operated.

Antenna Multiplier

3 Antenna Multipliers for each band worked with a wire antenna design or vertical antenna. Antennas must be fed with a single feedline and not be in a phased configuration. Quads are not considered wire antennas!

2 Antenna Multipliers for each band worked with a duo-, tri-, or quad-bander antenna fed with a single feedline and not in a phased configuration.

1 Antenna Multiplier for each band worked with an antenna not specified in the previous two categories.

Note that more than one antenna may be used on a band but *only one antenna may be used at a time*.

Final Score

QSO Points x Multiplier Average x Antenna Multiplier = Final Score.

Contest Entry

Entries must include a separate log for each band worked, a summary sheet itemizing QSOs per band, QSO points per band, multipliers per band, antenna multipliers per band, and total accumulated score. Entries must describe antenna used on each band and sign a declaration that the contest operator abided by the contest rules.

Entry Deadline

Entries must be *postmarked* and forwarded to the contest address below no later than October 20, 1987.

Rules, Forms, Entries

Forms are available from the contest committee. Send an SASE to: The National Championships, 2665 Busby Road, Oak Harbor WA 98277.

Disqualifications

Contestants not following the band-switching requirements will be disqualified. Stations falsely reporting antennas used or falsely reporting output power will be disqualified. Scores requiring more than a 3% scoring adjustment due to duplicate contacts or scoring errors will be disqualified. Contest committee decisions are final!

Penalties

A penalty of one multiplier point, before averaging, will be assessed for each duplicate contact count on the same band and not discounted by the contestant on his/her entry.

Awards

A minimum of 250 QSOs must be worked to be eligible for awards. Awards will be issued to the operator with the most points in each *Call District* and *U.S. State*. Plaques will be issued to the National SSB Champion and National CW Champion.

The CONTEST OPERATOR OF THE YEAR TROPHY will be awarded to the contester with the highest combined score for the two contests. ■

Send For Your National Championship Entry Forms Today

The National Championships
2665 Busby Road
Oak Harbor, WA 98277

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800 – 1300 MHz

Specifications:

Receiving mode – Narrow band FM, Wide band FM & AM

Receiver circuit – Microprocessor controlled PLL Frequency synthesized superheterodyne type with high-level doubled balanced mixer

Receiver IF – 750MHz, 45.03MHz, 5.5 MHz (WFM) and 455kHz (NFM & AM)

Sensitivity – NFM – 0.35 uV (12dB SINAD)
WFM – 1.00 uV (12dB SINAD)
AM – 1.00 uV (10dB S/N)

Selectivity – NFM – ±7.5kHz @ 6dB
±20kHz @ 70dB
WFM – ±50kHz @ 6dB
±250kHz @ 60dB
AM – ±5.0kHz @ 6dB
±10kHz @ 70dB

Number of memory channel – 20 channels
Scan rate – 5 channels per second
Search rate – 6 seconds per MHz
Antenna connector – Standard BNC type, 50-ohm
Audio output power – 1watt at less than 10% THD
Power requirement – 12 to 14Vdc at 300 to 500mA
Size and weight – 5.4"W x 3.15"H x 7.86"D, 2.6 lbs

Options

Cradled mobile mounting bracket
Trunk lid mobile antenna with 12 ft cable
Discone base antenna with 30 ft cable
RS-232C interface kit

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83-822	PL-259 Teflon, Amphenol	1.45
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UG-175	Reducer for RG-58	.20
UG-176	Reducer for RG-59 & MINI 8	.20
UG-21D/U	N Male RG-8, 213, 214, Amphenol	2.95
UG-21B/U	N Male RG-8, 213, 214, Kings	3.75
9913/PIN	N Male Pin for 9913, 9086, 8214 fits UG-21D/U & UG-21B/U N's	1.50
UG-21D/9913	N Male for RG-8 with 9913 Pin	3.95
UG-21B/9913	N Male for RG-8 with 9913 Pin	4.75
UG-146/U	N Male to SO-239, Teflon USA	5.00
UG-83/U	N Female to PL-259, Teflon USA	5.00

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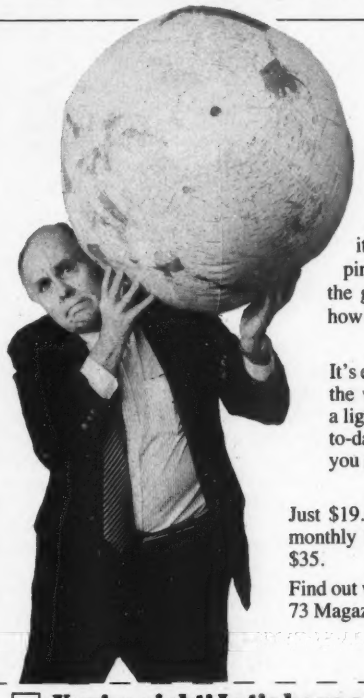

HEAVY STUFF

Face it, the world

of ham radio is a lot more complex than it used to be. We have new modes popping up every day, satellites racing around the globe, computers, spread-spectrum... how can you keep up with it all?

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Yaesu FT-690R II 6-Meter Multimode Transceiver

Yaesu USA
17210 Edwards Road
Cerritos CA 90701
Price Class: $570

Tonna 50/5 5-Element 6-Meter Yagi

Tonna Antennas imported by:
The PX Shack
52 Stonewyck Drive
Belle Mead NJ 08502
Price Class: $125

by Peter H. Putman KT2B

Photo A. The Yaesu FT-690R II configured for mobile operation.

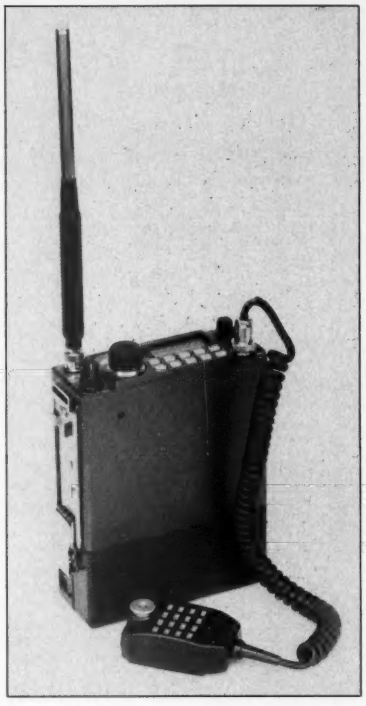

Photo B. The Yaesu FT-690R II configured for portable operation.

Readers of last month's FT-290R II/Tonna 144/9 review will recall how enthusiastic I was about the combination of this radio and antenna for 2-meter portable operation. Since that review worked out so well, I decided to take the same approach on 6 meters with this month's two products—and wound up having almost as much fun during the 50 MHz Spring Sprint.

The FT-690R II

Let's begin with the FT-690R II. The design approach here is similar to the FT-290R II—a combined mobile/fixed/portable multimode station in one package, using interchangeable battery cases or a snap-on final amplifier and heat-sink assembly for higher power. The FT-690R II uses the same accessories as the 2-meter version, including FBA-8 battery case, FTS-7 tone squelch unit, MH-10F8 speaker/microphone, and MH-15C8 DTMF microphone.

The NiCd charger is interchangeable, and so is the mobile mount. About the only unique accessory is the YHA-6 telescoping whip antenna, with a base-loaded coil measuring just over 40" long.

The big difference between the 690R and 290R is the output power when using the external amplifier: 10 Watts versus 25 Watts. I asked Chip Margelli of Yaesu why the difference. He said that 25-Watt power modules for 50 MHz are difficult to come by in Japan, but 10-Watt modules are not. Certainly an interesting situation, especially when one considers the popularity of 6 meters over there! Perhaps in the near future, a retro-fit 25-Watt module can be developed. (Using discrete power devices would be out of the question, considering the size of this amplifier assembly.)

"The FT-690R II represents a great value in a 10- or 2.5-Watt do-it-all, 6-meter rig."

The front-panel layout is nearly identical to the 290R II: 10 push-button keys control most of the functions, such as vfo selection, mode, tuning rate, repeater offsets, priority channel, high/low power, memory, and scan functions. The nameplate is finished in orange, as opposed to green for the 290R II (I guess to prevent confusion when in a hurry). The other basic controls are for volume, squelch, main tuning, and clarifier (RIT to the rest of us).

The modes available for operation are also the same as on 2 meters: USB, LSB, CW, and FM. The tuning rates on SSB and CW are selectable at 25-, 100-, and 2500-kHz steps; on FM they are 5-, 10-, and 20-kHz steps, respectively. The available offsets for repeater operation are either + or − 1 MHz, which is pretty much standard on 6 meters.

As with the 290R II, you can store frequency, mode, and offset information on any of ten channels, as well as scan between those channels. However, once a channel is selected through the memory switch, you cannot make excursions off that frequency. For example, you may wish to jump quickly from a repeater near 53.500 MHz to the SSB calling frequency of 50.110 MHz. You can do this with two memories, but to move up or down in frequency thereafter you must go back to either vfo. This is inconvenient, but more so on the 2-meter version. The clarifier control provides for some adjustment of the received signal, but does not alleviate the problem.

You can also split the two vfo's for half-duplex operation instead of using the standard 1-MHz offset. This is handy if you encounter a nonstandard-offset frequency pair. I can't

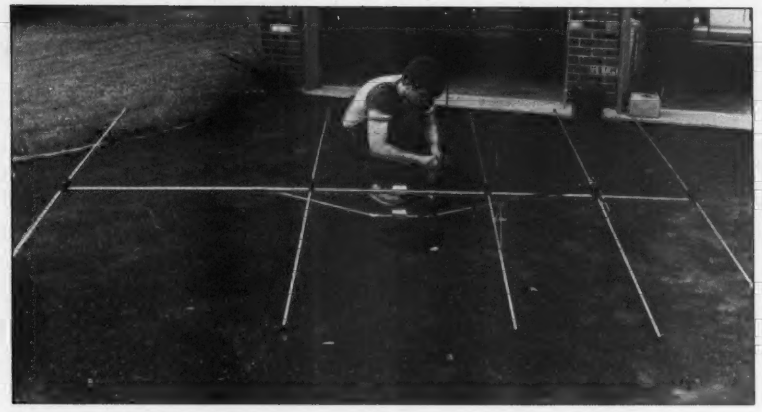

Photo C. Dave Skarbowski N2FAM puts the finishing touches on the Tonna 50/5 five-element, six-meter yagi.

forsee frequent usage for split vfo's on SSB or CW, as all operation on 6 meters is usually full transceive. (There might be the odd case of a DX station on CW working stations in the phone segment above 50.100 MHz, making the dual-vfo scheme practical.)

The FT-690R II lends itself well to mobile operation, although the right side spring bracket screw disappeared in transit from Yaesu, making the installation very difficult! Fortunately, a phone call resolved the problem, and a replacement spring and collar soon showed up. As with the FT-290R II, the amplifier module can be secured to the mobile bracket separately. The panel light is always enabled while operating off an external dc supply or battery with the power amplifier module. When the FBA-8 battery case is installed, you have to actuate the panel light separately, which of course saves unnecessary battery drain.

Now for a major problem. I found the display impossible to read in my Honda when I was wearing polarized sunglasses! The mounting place was conventional—under the center of the dashboard behind the stick shift. This was also the case on the FT-290R II, as a very unfortunate combination of the angle of the LCD screen and my polarized lenses turned the display almost black. I had to remove my glasses to change frequency, or tilt my head! A stronger backlight might overcome this problem—one I've never encountered before with LCD displays.

"The Tonna 50/5 is very light and a piece of cake to assemble."

Another problem with the MH-15C8 DTMF microphone was an almost complete failure of the DTMF keypad, resulting in only one tone from each pair being transmitted 90% of the time. Playing with the keypad buttons and a local receiver showed a clearly defective contact point on digits 5, 8, 3, 6, 9, and #. In other words—most of the pad. I attribute this to poor quality control on Yaesu's part. In the end it made no difference, since I never use DTMF operations on 6 meters.

Photo D. The Tonna 50/5 ready for trucking to the contest site.

The Tonna 50/5

Now for a look at the Tonna 50/5. Once again, the folks from France have come up with a clever scheme for a workaday 5-element yagi with reasonable gain and front-to-back ratio. The yagi electrically is .57 wavelengths, measuring 11′ 3-3/4″ and weighing in at just 14 pounds. This number is achieved by using rolled light-gauge aluminum stock to form the elements—similar to those used in television antennas. The elements are quite strong, although not like seamless aluminum stock. The boom is the conventional Tonna square stock, which is very rigid and easy to align elements and brackets on.

Tonna specifies the gain to be 10 dBi—about what you'd expect for a 5-element yagi on this length boom. The F/B ratio is −23.8 dB, but the front lobe is fairly broad with the −3 dB points encompassing about 75 degrees in the H plane. The antenna is not terribly sharp! For my purposes, though, the broad pattern was actually helpful since I was running QRP and rotating the antenna manually.

Assembly is a story in itself. Why is it that only the French can come up with such an easy-to-build yagi? I don't think it has ever taken more than a half hour to construct any of the Tonna products (with the exception of the 23- and 55-element 1296-MHz yagis). Everything is well marked, the parts count is correct, and the parts fit in good alignment—an assembler's dream. It was the same with the

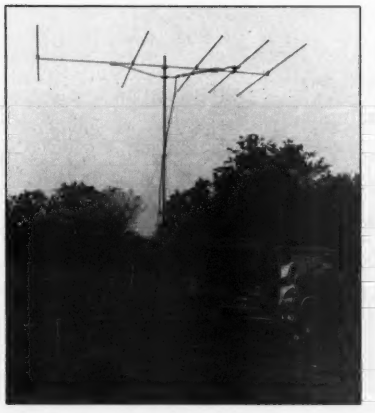

Photo E. The Tonna 50/5 set up at the contest site.

Photo F. KT2B operates the FT-690R II—2.5 Watts output to the Tonna 50/5.

50/5; I virtually ignored the instructions and worked from intuition.

The only flaw I could find was that the assembly manual showed no suggested starting point for the Beta match connections. This point was determined to be about 1-1/2 inches from the ends of the Beta rod, after much on-site experimentation with a Bird 43 and 5C slug. However, the Beta rod tuning is quite forgiving, as the worst swr measured at 50.100 MHz was the starting point, with the clips 1 inch from the ends of the driven-element support. Here, I saw over 2:1 swr. At the final set point, the measured swr at 50.100 MHz was better than 1.3:1. (These tests were taken with the yagi only 15 feet above ground, so I'm sure that ground effects exaggerated that number!)

The clamping method is unique: The rolled ends of the elements are isolated from the boom with special molded-plastic holders, and held in place by a compression nut (which is coaxial to the element) and ferrule arrangement. You slide the element all the way into the holder, then tighten the nut around the clamp point as needed. Result? You can't pull the elements out at all without causing major destruction to them—unless you loosen the nut, at which point they slide out like butter.

This in effect creates an antenna suitable for portable work. Just mark the element pairs with colored markers (or measure them on site—all five pairs are different lengths), then assemble the boom into three pieces and carry the elements bundled together. Once on site it takes about 20 minutes to put together. The only tool required is the ubiquitous 10mm wrench! The compression nuts can be tightened by hand, and the wrench takes care of the boom-to-mast clamp. The various boom sections and boom brace are secured by plastic wingnuts—how's that for simple!

The 50 MHz Spring Sprint

It seemed that the FT-690R and 50/5 were a marriage made in heaven, or at least in Pennsylvania. The next step was to find out how well that marriage worked, and the venue was the ARRL 50 MHz Sprint, held the Saturday of Memorial Day weekend. One of my neighbors to the north, Dave Skarbowski N2FAM, was enlisted to provide his truck for transportation and find an operating site nearby. (Actually, he volunteered, if you can believe it. Most people who know me expect to sit on a frozen mountaintop for hours when I ask if they'd like to "come along and help out" during a portable operation.) The site he chose was an open field of several acres nearly 540 feet ASL, putting it about 50 feet above average terrain.

We pulled up after 7 p.m. and within a short time had the beam up and were listening to all sorts of CQs from local stations. The band was dead, however, and the Q rate very slow. Initially I elected to use the battery case and just 2.5 Watts, and we did make contacts into Delaware and northern New Jersey in short order. K2BWR was worked in Atlantic City with good reports, over 50 miles away. As I mentioned earlier, it actually was handy to have the somewhat broad pattern on the 50/5 since all kinds of CQs were answered off the sides of the antenna (as well as a few off the back).

Specification	Claimed	Measured
Minimum Discernible Signal	n/a	> −130 dB
Sensitivity		
10 dB S/N	.2 uV SSB/CW	.2 uV
12 dB SINAD	.25 uV FM	.25 uV
Squelch Law	n/a	.12 uV FM .2 uV SSB/CW
Selectivity, −6 dB/−60 dB	2.4/5.2 kHz SSB 12/25 kHz FM	n/a n/a
Power Output at 50.100 MHz	10 Watts High	10 Watts High
With FL-6020 Amplifier	2.5 Watts Low	2.5 Watts Low
Power Output at 50.100 MHz	2.5 Watts High	2.7 Watts High
With FBA-8 Battery Pack	n/a Low	300 mW Low
Current Drain	80 mA Receive 1.1 A (2.5 W) 4 A (10 W)	n/a n/a n/a
TX/RX Coverage	50–54 MHz	50.000–54.000 MHz

Table 1. Performance measurements for the Yaesu FT-690R II.

Around 9:30 p.m. the band did open to Texas and Arkansas, with an occasional ping to Missouri and Kansas. But the 2.5 Watts just wasn't enough. Even the 10-Watt final amplifier wasn't enough! It took over 40 calls before I finally bagged KB7IJ/5 in grid square EM12 (near Dallas). Still, 1000+ miles is nothing to sneeze at. K5GW and K5UR were also heard running 20 over S9 at times, but I couldn't bag 'em. There's a big difference between 144-MHz and 50-MHz QRP operation: On 2, you can plug away with your 2.5 Watts and work a lot of stations running 100 Watts or less, but the majority of serious 6-meter operators are pushing a kilowatt. Of course they'd be S9 + 20 dB during an Es opening! That means with my 2.5 Watts and 10-dB antenna, I'm still giving up almost 16 dB in signal answering their calls. Thank you, KB7IJ, for persevering.

Gain, dBi	10.0
Electrical Length	.57 wavelength
F/B Ratio, dB	−23.8
−3 dB Points	75 degrees H plane 55 degrees E plane
Swr	Better than 1.2:1 from 50–51 MHz
Gain Bandwidth (−1 dB)	48.5–51.6 MHz
Length	11′ 3-3/4″
Weight	14 lbs.

Table 2. Specifications for the Tonna 50/5.

The final totals weren't too great—16 stations in 4 grids—but the Sprint did prove to me how well the receiver worked near adjacent strong stations. Front-end sensitivity was excellent, making my job of operating QRP all that much more frustrating! Ah well, at least we saw some beautiful star formations and a great sunset. Dave contributed a few cold beers as well, and we had fun taking pictures of the setup.

The final step was to put the FT-690R II on the bench and through its paces. I was mostly concerned with sensitivity, since I couldn't easily measure dynamic range. The latter was estimated at about 110 dB+ based on contest observations.

Conclusions

There you have it—the 6-meter portable station for today. Both products work very well in the field—especially together! The FT-690R II represents a great value in a 10- or 2.5-Watt do-it-all, 6-meter rig for base, mobile, or portable. You can easily add a 100-Watt "brick" for more juice if needed. It would be nice to have some provision for a tight filter option as well as being able to set the vfo's instantly to any memory channel as a starting point. The display polarization problem is unfortunate, but might only have been caused by that particular pair of sunglasses.

Before you ask, there is a FT-790R II on its way to the U.S. market. I'll review it in conjunction with the Tonna 21-element portable 70-cm yagi, so look for that review in the future!

The Tonna 50/5 is very light and a piece of cake to assemble. (It's so light in fact that I'd like to see a longer version with a tighter pattern up front—say, about six or seven elements.) The construction is first-rate, although the instructions could be more helpful regarding the Beta match. No doubt stacking two of them (easily done) would improve and sharpen the pattern. Overall, it is an ideal portable contest antenna and uses simple assembly techniques that anyone can deal with.

For more information about the FT-690R II, circle number 201 on your Reader Service card. For more information about the Tonna 50/5 yagi, circle number 202 on your Reader Service card. ■

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SP-20 Ext. speaker w/audio filter	149.00	**134.95**
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FL-102 6 kHz AM filter	56.00	
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SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal (745/751)	63.00	
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SM-8 Desk mic - two cables, Scan	78.50	
SM-10 Compressor/graph EQ, 8 pin mic	136.25	**124.95**
AT-100 100W 8-band auto. antenna tuner	445.00	**389.95**
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IC-28A 25W 2m FM, TTP mic	459.00	**399.95**
IC-28H 45W 2m FM, TTP mic	489.00	**429.95**
IC-38A 25W 220 FM, TTP mic	489.00	**429.95**
IC-48A 25W 440-450 FM, TTP mic	489.00	**429.95**
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Larsen PO-K Roof mount	20.00	
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Heath HW-9 QRP CW Transceiver

by Mike Bryce WB8VGE

Heath Company
Benton Harbor MI 49022
Price Class: $200

Photo A. The Heath HW-9 shown with the optional PSA-9 power supply.

The HW-8 is a tough act to follow, but the Heath Company is betting on the HW-9 to take over now that the HW-8 is no more. After selling more than 15,000 units, Heath quietly removed the HW-8 from their catalog. This left a vacuum in under 5-Watt transceivers, since Ten-Tec also dropped the Argonaut 515. No one seemed too eager to fill this void. That is until now, with the HW-9, a third-generation QRP transceiver from Heath.

The HW-9 is a CW-only transceiver that covers 80 through 15 meters. With the accessory HWA-9 band pack ($30) you can extend coverage to all the WARC bands and the lower 250 kHz of 10 meters. The HW-9 also has full break-in keying (QSK) plus a newly designed wideband front end for no tune-up operation.

I really don't know why Heath supplies screws for any of their radios—everyone who comes to my shack wants to see the insides of the newest Heath creation. Inside there are not one but two circuit boards, the oscillator and T/R circuit boards. Neither of the boards is double-sided, and both the boards are the same size as the case. It's quite crowded inside the HW-9, perhaps because Heath used the same size case as the old HW-8. They must have had some extra ones lying about in the metal shop. Gone is the infamous two-tone Heath green color scheme; in its place is a new bronze paint job.

Features

The front panel has also been redesigned. Band selection is now done via a rotary switch instead of the older push-buttons, as was the case with the HW-8. Yelling and screaming from HW-8 users helped add two new features to the HW-9: receiver incremental tuning (RIT) and a superhet receiver (to succeed the often-cursed direct-conversion receiver that the HW-7 and HW-8 sported). The superhet receiver utilizes a 9-MHz i-f and a four-pole crystal filter. An improved active audio filter and an audio amplifier that will drive a speaker or low-impedance headphones round things out for the receiver. The front-mounted meter gives relative S-units during receive and functions as a relative output meter during transmit.

The transmitter this time around had the power boosted to 4 Watts output on all bands except 10. You'll get 3 Watts out on 10 meters. A front-panel control will vary the transmitter output from zero to full power. The power amplifier is made up of two transistors in parallel to produce the rf output. A zener diode straps the collectors of both transistors to ground for protection against high swr on the antenna. The HW-9 requires an external power supply that can supply 12.6 V dc at at least 1 Ampere. (Heath's PSA-9 power supply kit costs about $20.)

Construction

Of course the HW-9 comes in kit form. I was surprised to see that only two pages of changes were included. What can I say about the manual—classic Heathkit. I started construction by first cleaning off my work table, a major undertaking in its own right. I have to fess up a bit. Whenever I build a Heathkit, I never check parts off until they are ready to be installed. I do group like parts together in small piles: resistors in one pile, transistors in another, etc.

This HW-9 is the first Heathkit that I've assembled that uses taped components. Resistors, diodes, and small glass capacitors are mounted on tape strips. Each circuit board is set up in sections. By locating the proper taped parts, all one has to do is stuff the correct section. This sure is different from what I have been used to in the past from Heath. I did have some trouble with this new system. I started to go too fast and ignore the check-offs

Photo B. Rear panel of the HW-9.

in the book. Somehow in the wee hours of the morning, I got screwed up and installed parts in the wrong place on the T/R board. I recommend a slow pace when installing the taped components.

Construction begins with the oscillator board. Things went along quite well for a while until trouble raised it's ugly head. The oscillator circuit board seemed to have a lot of extra holes left over after all the taped parts were installed. Hummmm, seems these are for the optional WARC band kit. Well take it from me, install the WARC band kit while you're assembling the HW-9. To do so after the fact will involve a terrible amount of work.

The T/R board is quite dense. Use extra care with the tape components. There are 2 coils which must be wound for the transmitter. These must be done correctly or the transmitter will not work. After the boards are stuffed, cables are used to interconnect the different circuits. Instead of the usual Heath wiring harness, you make up your own. Small labels are used to mark the coaxial cables. After checking the soldering on both boards, you can finally get down to putting things together.

Mechanical assembly went smoothly. The end was in sight. Vfo capacitor and front-panel controls were added to the chassis. The HW-9 started to take shape.

Alignment

After all the parts are installed, we can start some resistance tests. Now I have to confess that I'm not much for doing resistance tests when building equipment. I did a few and things looked good, so I went on to alignment.

Alignment of the HW-9 requires the use of a VTVM or DVM, a frequency counter with a range to 10 MHz and an accuracy of .01%, and an rf detector—which Heath has built into the transceiver.

Everything seemed to be going just fine until I came to the vfo. Try as I could, I could not seem to get the vfo to track the dial. I spent most of an evening working on the problem. Oh, I did get things to perform, only after I discovered that the main tuning dial slips. In fact, it slips a lot. The next morning I called Heathkit. Yep, we know of the problem, not much you can do, but here are some suggestions. Remove the vfo shield (the shield causes some binding). Reset the vfo capacitor (this may also cause some binding). Don't tune past the stops (this wears down the vernier drive). Well, I did all of the above and it worked, sort of. It appears that Heath, in order to keep the HW-9 the same size as the HW-8, had to use a much smaller vernier drive. The

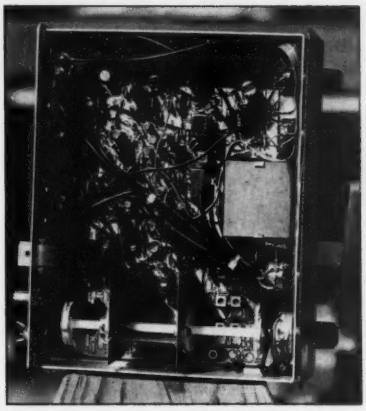

Photo C. Inside the HW-9.

new drive is way too small for the job of tuning the vfo capacitor. What I finally did was to disassemble the vernier drive, bend the spring washers to add more drag, and reassemble it. So far, so good—I have not had any more trouble with the drive slipping.

Having fixed that problem, alignment continued along smoothly for several more manual pages—until I came to the page containing the transmit bandpass alignment. While I didn't have trouble with the alignment proper, the way it has to be done is a real pooper! To adjust the coils for the 15-meter band, you have to remove the bandswitch shaft. That's not much fun. Reinstalling same shaft is even less fun. Take your time and things should go smoothly, I hope.

The balance of the alignment went without a hitch. Finally, I was able to press-on the blue and white label to the bottom cover. The HW-9 was done.

Operation

Operation proved a pleasant surprise. After the sidetone was adjusted to my liking, I fired up on 40 and gave a quick listen. The receiver proved quite sensitive. The S-meter is a bit scotch, but can be adjusted to the end user's need. I had some audio howling when I went to a band position that was not active (I did not install the WARC kit). I had one of the i-f stages oscillating; re-tuning the coils remedied the difficulty.

With a bit more kick out of the transmitter, I was able to work just about everything I heard. The QSK, while not quite up to Ten-Tec standards, worked flawlessly. I like the QSK time to be a bit slow and was able to set the time to my liking. The RIT and the audio filters work well. A speaker plugged into the HW-9 provides plenty of audio.

Will the HW-9 replace the HW-8? It sure has a good start. With all the features that everyone wanted on the HW-8, plus no-tune operation and WARC coverage, the HW-9 will fit the needs of the low-power operator. The HW-9 is a solid performer. QRP operator, Novice, or CW buff will find it a welcome addition to the shack.

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The Year 2000— Packet Radio Then and Now

The author predicts packet radio of the future— using today's technology!

Any attempt to look into a crystal ball and predict new ideas and technical developments ten years from now will be about as successful as the predictions of a 1920's airline executive trying to quess the business future of air travel before the invention of the jet engine. It is possible, though, to visualize where application and experimention with currently available techniques and equipment (plus hard work) could take amateur radio digital communications in 10 years.

The year 2000. . .due to continuing politico-technical problems our three sync-orbit satellites that would provide world-wide communications coverage are still waiting for a ride into orbit. Currently, we have a microwave relay system providing 24 hour/day networking for the USA and Canada as well as several paths linking up through Central and South America. This system can handle over a thousand bytes of binary information per second throughput with completely automated routing to destination. Entry and exit of data for this microwave system is through several hundred gateway nodes, each servicing a local area. The best description in late 80's terms for one of these gateways is: a very smart bulletin board with several ports on local VHF channels and at least two full-duplex, 10-MHz bandwidth microwave links to adjacent gateways. Each of these have at least 50 megabytes of RAM-disk on line and a hundred times this in CD-ROM data base. Traffic on the microwave system consists of blocks of binary data providing a transparent system for the many modes of digitized voice, video graphics, and data-compression schemes used to update gateway memories to current conditions.

During a local or national emergency, any one of or group of gateways gain priority status and can deliver hundreds of messages per hour to and from addresses within local areas. Because of the complexity of the rf and digital systems involved, few of these gateways are individual amateurs. Most gateways are the result of the combined effort of public-spirited groups and clubs who have found a way to really serve the public need for emergency communication on a nation-wide basis,

"Currently, we have a microwave relay system providing 24-hour-per-day networking for the USA and Canada, as well as several paths linking up through Central and South America . . ."

and also provide a new service for hundreds of local amateur operators who need only a TNC to access their local net.

There are severe problems with the hordes of youngsters who have become digital hams to gain time on the data bases and interactive strategy games. . .

1987. . .Every bit and piece of hardware and software needed to implement the system described above is already obtainable by amateurs. What is lacking is the time and effort to put the system into operation 24 hours a day, 365 days a year. Any amateur who is operational today on packet using a TNC from Kantronics, AEA, PacComm, or Tink-2 (or look-alikes made in the last year or so) is ready now. Due to Paul Rinaldo W4RI, we have an adequate standard protocol—AX.25—for local area operation. Two-tone 1200 baud AFSK simplex has been obsolete for ten years, but it has one very big advantage—it works like a charm through "standard" voice-type FM repeaters for local networking and terminal-to-terminal operation. A simple agreement to limit packet operation to "emergency only" during commuting hours will usually allow full operation the other 20 hours/day on these super-repeaters with area- and state-wide coverage. The last ten years have seen a steady improvement in equipment and coordination in amateur digital operation, much of which is based on the inspiration and perspiration of VE7APU and the VADC group.

There is one notable exception to this curve: a steady, well-implemented, and self-serving promotion, by various groups and suppliers of packet equipment, which has created the impression that their TNC makes every station a repeater that is able to network a national traffic system on the same channel used for local traffic. Single-speed digipeating can serve a very useful purpose outside of metropolitan areas where channels without local activity are available and reduction of throughput by 50% is acceptable, but any system that attempts routing of traffic outside his local area by individual operators is doomed to failure during an emergency. The bright side of this is that if increased traffic through multi-digi's hadn't created such a problem, WØRLI wouldn't have started the development of the missing link that makes long-haul traffic practical. This is real amateur spirit. . .find about $100 worth of computer surplus, sweat out hundreds of hours of programming time to adapt this to current TNC standards so that anyone can use it, and then give the program to any ham that sends him a blank disk. The next time you check into a bulletin board, think a moment about the contribution of WØRLI and the many others who have added their efforts to make these PBBS's into gateways that do automatic-message forwarding. The next time you are in the middle of an interesting packet QSO and someone accesses a PBBS with a four-page help menu on a three-hop digi-link through one of your locals that leaves his digi on, realize that the problem lies not with the PBBS, but with the lack of digipeater operation coordination.

The latest PBBS listings show more than a hundred now in operation and those spread out over the whole country, most on a 24-hour-a-day basis, and most able to receive and forward traffic to other gateways as well as serve their local area. This is a giant step toward a national traffic network. Still it cannot handle the reasonably large bursts of traffic that any emergency would create. The program requires routing information either from the incoming port or the sysop of the PBBS. It forwards this on a time schedule without considering traffic load or alternate

routing to compensate for an overloaded gateway or equipment outage. As the volume of traffic grows, the system at some point crashes due to the "white-lightning" effect. This is the common term used to describe a digital communication system that tries to handle one byte more of data of throughput than error correction can manage. The system then requires reset and complete re-boot.

It will be some time before the W0RLI PBBS problem becomes serious, particularly away from large cities or the common paths between E/W or N/S heavy traffic centers. A few weeks ago, Kantronics started shipping an accessory package. It can be field-installed in less than an hour in any TNC. The package brings the TNC up to their latest version, adds 32K of RAM, and implements a self-contained Personal Packet Mailbox (PPM), all for the user-friendly price of about $50. This has been greeted by the packet community and competing manufacturers with a dull ho-hum. Everyone knows that you need at least 700K of on-line memory to run a W0RLI-style PBBS that can forward traffic, so it is doubtful if even Kantronics realized that they had provided the solution for the "white lightning" problem! As long as one or more stations in your local group agrees to keep his rf equipment and TNC operational 24 hours/day, an agreement can be made with one or more of the gateways to service any traffic not addressed to a local group member. There is no need to keep one's ASCII terminal or computer turned on or attached.

This Personal Packet Mailbox runs in a background mode and has little or no effect on any other normal operation of that packet station, and like any polite child, only speaks when spoken to. There is no way that the sysop can make it transmit anything, yet any station on the channel can call and service any addressed traffic. Of upmost importance, the PPM lists amounts of unused PPM memory, allowing the gateway inquiry to make automatic decisions about polling interval. This includes unloading local traffic to give the PPM some space until things slow down to normal or replacing it with a short summary so local stations are alerted.

To begin with, minor program changes in any W0RLI PBBS will allow a simplified form of this mode of operation, which may be called "forward on request", until someone thinks of a better name. The first advantage will be that the gateway can use a narrow-pattern, high-gain antenna, controlled by the computer since all the exchanges of data in this mode are initiated by the gateway. After a reasonable period to allow his locals to appreciate a fast-reaction local PPM serviced by a gateway, he can close down all direct traffic entry from individual stations to start the interesting job of reprogramming the gateway into a point-to-point relay between adjacent gateways and star-network controller for traffic in or out of his region. During periods of no traffic, gateways will update each other's data bases with preferred routing based on current system capabilities and traffic load history, lists of all active calls on local packet nets, etc.

The 1-MHz CPM Xerox™ board and klunker 8" drives are going to run out of gas very soon, but a turbo-XT Clone or an 8-MHz SBX-180 with hard disk should take you into the late 90's and not bend the budget of even a medium-sized amateur club beyond recovery. Programming must be flexible, adaptable to local agreements and protocol between the PPM's and their gateways, and expandable to keep up with the needs of point-to-point relays to adjacent gateways. This would be an ideal joint public service project, for groups such as local packet-operator clubs, computer-user groups, and FM repeater clubs that have good rf sites in the area.

"The latest PBBS listings show well over a hundred now in operation and spread out well over the whole country, most on a 24-hour-a-day basis, and most are able to receive and forward traffic to other gateways as well as serve their local area."

The 1200-baud AFSK AX.25 protocol should be more than adequate for local groups using 145-, 223-, 440-, 915-, and 1296-MHz NBFM channels during the next few years. However, during a local emergency, one gateway may be called on to service 15 or 20 of its PPMs loaded with out-of-state traffic. Let's hope that by this time the gateway has had at least one solid microwave point-to-point link to another gateway in a direction away from the problem area with a throughput of data rate that will occupy several MHz of band-width out of the over 1000 MHz presently allocated to us between 2.3 GHz and 10.5 GHz. What protocol is used by the microwave links? It is whatever the two ends of that path like and find reliable. A block of data being relayed 3000 miles may go through several protocol and data-rate changes, be forced to back-track many hops, and rerouted around a blown fuse in a remote site, and still be sitting error-free in a local PPM near the addressee in a matter of minutes.

We can't wait for the select committee of the ARRL to agree on a level-3 network protocol; they have been discussing this already for five years. Even if the overall requirement of the protocol they are searching for (I suspect) is software that can be spliced into AX.25 and run in a TNC that is plugged into the jacks of an unmodified HT, it's much too late and far too thin to be of any real value.

I am not just taking a cheap shot at the members of this group; quite the contrary, I have the greatest respect for their efforts and technical contributions to amateur radio—W4RI and VE7APU in particular. We've all been through the same school of practical experience in the communications field. Those with rf backgrounds have always tried to pack information into the narrowest possible bandwidth to improve signal/noise ratios or to fit into the cracks between immovable objects. The digital types are totally focussed on protocols developed in the past 50 years of communicating through a wired network where the operating costs go up exponentially above 10 kHz of bandwidth. After looking at the trees for too long, it is time to back up and again look at the forest. This is 1987, and we have an urgent need to move large blocks of data from point A to point B in a reasonable length of time and at an affordable cost. We can use all or any part of the following bands of frequency: 2300 MHz with 70-MHz bandwidth, 3300 MHz with 200-MHz bandwidth, 5650 MHz with a 275-MHz bandwidth, and 10000 MHz with a 500-MHz bandwidth. You can buy new GaAsFETs for less than $25 for low-noise RCVR front-ends, cheap used Tele-Vision Receive-Only (TVRO) dishes for antennas, and, if you dig down under the computer scrap at your next flea market, you might find Traveling Wave Tubes (TWTs) that will put out 1–10 watts on these bands.

If you are still with me after this long dissertation, you are hooked and might as well start High-data Rate Microwave Relay Kindergarten with us. The technical group of the Cherryville Repeater Association has started to put together both ends of a 70-mile, one-hop relay link northwest into a site in Pennsylvania that has a clear shot toward Ohio. We are starting with 19.2 kB of pure binary data at 100 kHz or more of bandwidth, with 20 watts of 2.3 GHz feed-point power and under 2-dB NF Rcvr on each end. I think we may be in the first grade this summer, so drop a message into your nearest packet gateway to K2TKN via WB2GWD and we will do two things—keep you informed of our learning curve and keep track of delivery time so we can score on the whole packet traffic system as it expands into a primary public-service communication pipeline.

You might also drop a note to a famous publisher of a well-known amateur radio magazine that a public service donation of a data base in CD-ROM or Worm, containing the USA Callbook would furnish a key system block that none of us can scrounge.

The Year 2000—I forgot to mention that there are still many very loud signals calling CQ DX and the same familiar types dog-fighting in the pile-ups to see who can flat-top their speech processors so they can be king of the hill for the day. OH WELL.. ■

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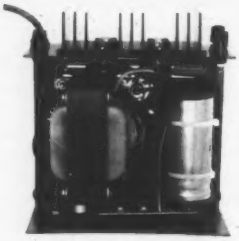

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RS-20S	16	20	5 x 9 x 10½	18

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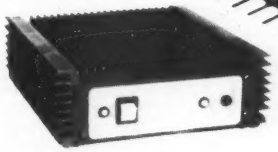

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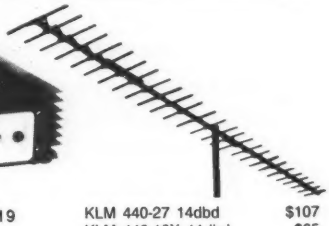

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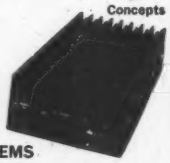

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AI on Packet?

TRON is a computer program that will simulate a live operator. It is written in Basic and runs your packet station while you are busy doing other things. There are no external interfaces except for the normal TNC found in almost all packet stations. It is fun for those who check in to your station, and will amaze your friends. At first glance, one might think that you are using an artificial intelligence (AI) program in your computer, although this is not strictly the case.

I wrote TRON on a TRS-80 Model 4 computer, but it could easily be adapted to other computers running Microsoft Basic. I will explain the workings of the program and give you tips on what areas you would need to change for your computer.

How The Program Works

The program accesses four files. The first, TRON/LOG, is initialized while in DOS before the Basic program is run. The next is CALLFILE/DAT, which contains calls and operator names of previously worked stations. The third file NAMECHK/DAT, a list of words used for checking the validity of names, is built with a word processor. The last file, RESPONSE/DAT, is also built with a word processor and is the first file you will want to alter after you have the program up and running. This file is also used to customize the Robot to your operation.

I used the DOS command ROUTE to access the disk and to save a copy of communications in progress, since ROUTE does not interfere with communications coming in on the RS-232 line. The communications driver of the DOS (COM/DVR) was used, and the SETCOM command was used to set up our parameters. This makes programming simple, since the power of the DOS can be used to route the printer to a disk file named TRON/LOG. You must do the route from DOS Ready before entering into the Basic program, since this sets aside memory for the Route. The COM/DVR is then set and a SETCOM done. How to do this will be shown later in the article.

The first thing the program does is load the arrays for the call/name array, the response array, and the name-checking array. This takes place in line 130, with a GOSUB to each routine. To enable the I/O interrupts in line 160 do an OUT &HE0,0.

Next, commands are sent to the TNC to make sure that the configuration is right for our operation. This takes place in lines 170 and 175. You may want to make some changes here, since your operation type may be different from mine. The reset command may be a different word in your TNC. In mine, which is Kantronics, RESET is a soft reset and doesn't change any parameters. I think the AEA uses RESTART (check your manual). LOCK OFF causes everything coming to the computer from the TNC to be in upper case, which makes the selection of key words easier.

"I wrote TRON on a TRS-80 Model-IV computer, but it could easily be adapted to other computers running microsoft Basic."

To read the RS-232 port and see ifdata is coming in, take a brief excursion via GOSUB 400 to see if the operator has entered a command from the keyboard. We are looking for 256 characters—the maximum size of a packet—coming into the port. If a carriage return comes in the packet is terminated and printed. And, if the line printer has been selected, a copy will go to the line printer. If the disk option has been selected, the material that would go to the line printer will go to disk.

We now have a complete packet and must select a response to send. The first step is to identify what was received in a packet by going through the array of key words from the RESPONSE/DAT file and searching for the occurrence of that particular string in our packet string. The matching response is picked when a match is found.

The first packet received when being connected to, is the "CONNECTED TO" packet. This triggers a particular series of events. The callsign is looked up in the "CALLFILE/DAT" file and if a match is found response number one is sent to the TNC via GOSUB 700. If no match is found, response number three is sent and the program waits for an answer. The answer is checked in the subroutine at line 1700 against the words in the "NAMECHK/DAT" file and, if a match is found in the invalid names list, response number five is sent and an answer waited for.

From this point on we are looking for normal communications (How is the weather?, What rig are you running?, etc.) and responses are sent to each key word received. If no key word is found, the response in the last line is sent. If a "***DISCONNECTED" packet is received, the program returns to the beginning and starts over.

Operating the Program

Operating the program is easy. After preparing the JCL file, at DOS Ready type DO TRON and press ENTER>. The COM/DVR will be loaded and the parameters will be set using the SETCOM command. TRON will be loaded into Basic, the program will come up in the Robot mode, and be ready to receive the first caller. If you want to send all conversation to disk, press "M" and a menu will come on screen. F1 is a printer/disk toggle. Keystroking F2 shows that ON and OFF are toggled. Using F1 and F2 sets the disk to ON. A copy of all communications will now go to the disk.

When exiting the program be sure to use the shift F3 key. This will cause the route from the printer to disk to be reset and also close the file. From the menu press F3 and you will be in the communications mode. Press F3 again and you will go back to Robot mode.

The Data Base

Setting up the data base is the fun part. This is where you enter the responses to the key words that come in on the communications line. The first five key words are a no-no to change. These lines are used in the program for special functions and their position is used in picking the right function. You may change the response to the key word but *don't* change the number at the end of the line. You will notice that each line is composed of:

"key word>", "response 1>", "response 2>", number>

By breaking the response into two parts, we can put the caller's name in the middle or on

either end of our reply. When adding key words you can use words, parts of words, or several words. When using similar words, remember that the program selects from top to bottom. Stack the key words like this:

MESSAGE TO WILLY

TAKE A MESSAGE
MESSAGE

Since computers are very selective, a misspelled word will cause the computer to pick the wrong response or no response at all. In this case the last response in the data base is picked. I sometimes use just parts of a phrase or word chopping off either end or both ends. For example:

TAKE A MESSAGE TO WILLY
MESSAGE TO WILL
SSAGE TO WILL

```
10 REM  VER  1.0   02/17/87
20 REM  FILE NAME  'TRON/BAS'
30 REM  WRITTEN BY  WILLIAM MCMULLAN RT 6 BOX 1 BASTROP, LA. 7122
        0

40 REM  FROM DOS Ready
50 REM SET *CL TO COM/DVR
60 REM SETCOM (B=300,W=8,P=N,S=1,RTS=ON)
70 REM ROUTE *PR TO TRON/LOG
80 CLEAR:DEFINT A-Z
90 DIM D(100):DIM KW$(100):DIM RES1$(100):DIM RES2$(100):DIM CL$(
       100,2):DIM CHK$(20)
100 P1$="** PRINTER":P2$="**  DISK  "
110 D1$=" OFF **":D2$="  ON **"
130 CLS:GOSUB 1300:GOSUB 1500:GOSUB 2000: REM **** LOAD ARRAYS
140 PRINT @(2,2),"** IN ROBOT MODE **";:GOSUB 1600
150 REM OUT 232,0:OUT 232,164:OUT 233,85:REM ** MOD III **
160 OUT &HE0,0: REM ** MOD IV **
170 RES$=CHR$(3):GOSUB 790:RES$="RESET":GOSUB 790:RES$="MONITOR O
        FF":GOSUB 790:RES$="LCOK OFF":GOSUB 790:RES$="CMSG OFF"
        :GOSUB 790
175  A$=CHR$(3):GOSUB 1010:RES$="ECHO OFF":GOSUB 790
180 PRINT @(2,27),"** WAITING FOR CONNECT **";:PRINT @(23,0),"";:
        RES$="":CAL$="":NAM$="":KW1=0:C=0
200 REM ************ READ RS232 LINE ***************
210 FOR Y=0 TO 255
220 GOSUB 400:IF INP(234) AND 128 THEN B$=CHR$(INP(235)) ELSE 220
230 P$=P$+B$
240 IF B$=CHR$(13) THEN Y=255
250 NEXT Y
260 PAC$=P$:P$="":P=1
270 PRINT PAC$
280 IF LP THEN LPRINT PAC$
290 IF P THEN GOSUB 500
300 GOTO 210
400 REM ********** READ KEYBOARD & GOTO FUNCTIONS **********
410 A$=INKEY$
420 IF A$="M" OR A$="m" THEN GOSUB 4000
430 RETURN
500 REM ************* CHECK PACKET FOR KEY WORDS ****************
510 IF KW1=3 OR KW1=5 THEN GOSUB 1100:GOTO 650
520 FOR KW=1 TO Z: REM KW=KEY WORD
530 L=LEN(PAC$):LL=LEN(KW$(KW))
540 FOR X=1 TO L:IF MID$(PAC$,X,LL)=KW$(KW) THEN KW1=KW:X=L:KW=Z
550 NEXT X
560 NEXT KW
570 IF KW1=1 THEN L1=INSTR(PAC$,"TO") ELSE 620
580 CAL1$=MID$(PAC$,(L1+3),10)+" "
590 L2=INSTR(CAL1$," ")
600 CAL$=LEFT$(CAL1$,(L2-1))
610 GOSUB 1200
620 IF KW1=1 THEN C=1:IF NAM$="" THEN KW1=3
630 IF KW1=1 OR KW1=3 THEN SOUND 5,5: PRINT @(2,27),"** CONNECTED
        TO ";CAL$;" **     ";:PRINT @(23,0),"";
640 IF KW1=2 THEN C=0:GOTO 180
650 GOSUB 700
660 RETURN
700 REM ************* SEND RESPONSE ***************
710 IF D(KW1)=2 THEN RES$=RES1$(KW1)+NAM$+RES2$(KW1):GOTO 770
720 IF D(KW1)=1 THEN RES$=RES1$(KW1)+NAM$+RES2$(KW1):GOTO 770
730 IF D(KW1)=0 THEN RES$=RES1$(KW1)+RES2$(KW1):GOTO 770
740 IF D(KW1)=3 THEN RES$=RES1$(KW1)+RES2$(KW1)+NAM$:GOTO 770
750 IF D(KW1)=4 THEN RES$=RES1$(KW1)+NAM$+RES2$(KW1):GOTO 770
760 IF D(KW1)=5 THEN RES$=NAM$+RES1$(KW1)+RES2$(KW1):GOTO 770
770 IF LP THEN LPRINT RES$
780 P=0
790 LR=LEN(RES$)
800 IF LR=0 THEN KW1=Z:GOTO 710
810 FOR J=1 TO LR
820 A$=MID$(RES$,J,1)
830 IF A$="^" THEN A$=CHR$(13)
840 GOSUB 1010
850 PRINT A$;
860 FOR JJ=1 TO 20:NEXT JJ
870 NEXT J
880 FOR JJ=1 TO 20:NEXT JJ
890 A$=CHR$(13):GOSUB 1010:PRINT:FOR JJ=1 TO 1000:NEXT JJ
900 IF D(KW1)=1 THEN FOR JJ=1 TO 800:NEXT JJ:A$=CHR$(3):GOSUB 101
        0:A$="D":GOSUB 1010
910 A$=CHR$(13):GOSUB 1010
920 IF KW1=3 OR KW1=5 THEN 930 ELSE KW1=Z
930 RETURN
1000 REM ************ SEND A$ OUT RS232 PORT ***************
1010 IF INP(234) AND 64 THEN OUT 235,ASC(A$) ELSE 1010
1020 RETURN
1100 REM ************* PICK NAME FROM PACKET ****************
1110 PAC$=PAC$+" ":PO=INSTR(PAC$," "):NAM$=LEFT$(PAC$,(PO-2))
1120 LN=LEN(NAM$):NM$=MID$(NAM$,2,LN-1):NM$=LEFT$(NAM$,1)
1130 FOR JJ=2 TO LN-1:LC$=MID$(NAM$,JJ,1):LC$=CHR$(ASC(LC$)+32)
1140 NM$=NM$+LC$:NEXT JJ
1150 NAM$=NM$:NM$=""
1160 GOSUB 1700:IF KW1=5 THEN NAM$="":RETURN
1170 GOSUB 1400
1180 RETURN
1200 REM ********** LOOK UP NAME *************
1210 NAM$=""
1220 FOR J=1 TO J2
1230 IF CAL$=CL$(J,1) THEN NAM$=CL$(J,2):J=J2
1240 NEXT
1250 RETURN
1300 REM ************ READ CALLS INTO ARRAY **************
1310 OPEN "I",1,"CALLFILE/DAT"
1320 IF EOF(1) THEN 1360
1330 INPUT #1,CL$,NA$
1335 IF CL$="END" THEN 1360
1340 J2=J2+1:CL$(J2,1)=CL$:CL$(J2,2)=NA$
1350 GOTO 1320
1360 CLOSE 1
1370 RETURN
1400 REM ********** SAVE CALLS AND NAMES TO DISK **************
1410 OPEN "E",1,"CALLFILE/DAT"
1420 WRITE# 1,CAL$,NAM$
1430 J2=J2+1:CL$(J2,1)=CAL$:CL$(J2,2)=NAM$
1440 CLOSE 1
1450 RETURN
1500 REM ************ SCROLL PROTECT TOP FOUR LINES **************
       ****
1510 POKE 2964,4 : REM SCROLL PROTECT TOP 4 LINES
1520 PRINT @(0,0),STRING$(80,"=");
1530 PRINT @(1,3),"'TRON' THE  ROBOT":PRINT @(1,64)," M = MENU
       ";
1540 PRINT @(3,0),STRING$(80,"=");
1550 RETURN
1600 REM ********** SELECT & DISPLAY PRINTER/DISK ***************
1610 P3$=P1$+D1$
1620 PRINT @(2,61),P3$;:PRINT @(23,0),"";
1630 IF P3$="** PRINTER  ON **" THEN LP=1:SYSTEM "RESET *PR"
1640 IF P3$="** PRINTER OFF **" THEN LP=0:SYSTEM "RESET *PR"
1650 IF P3$="**  DISK    ON **" THEN LP=1:SYSTEM "ROUTE *PR TO TR
       ON/LOG"
1660 IF P3$="**  DISK   OFF **" THEN LP=0:SYSTEM "RESET *PR
1670 RETURN
1700 REM ********** CHECK VALIDITY OF NAME **********
1710 KW1=4
1720 FOR X=1 TO XX
1730 IF NAM$=CHK$(X) THEN KW1=5:X=10
1740 NEXT X
1750 RETURN
2000 REM ************ READ RESPONSE'S TO ARRAY ****************
2010 OPEN "I",1,"RESPONSE/DAT"
2020 IF EOF(1) THEN 2060
2025 Z=Z+1
2040 INPUT #1,KW$(Z),RES1$(Z),RES2$(Z),D(Z)
2045 IF KW$(Z)="END" THEN 2060
2050 GOTO 2020
2060 CLOSE 1
2070 REM ---------- LOAD NAME CHECK WORDS ---------------
2075 XX=0
2080 OPEN "I",1,"NAMECHK/DAT"
2090 IF EOF(1) THEN 2130
2100 XX=XX+1
2110 INPUT #1,CHK$(XX)
2115 IF CHK$(XX)="END" THEN 2130
2120 GOTO 2090
2130 CLOSE 1
2140 RETURN
4000 REM ********** MENU ROUTINE ************
4010 PRINT @(23,38),"MENU"
4020 PRINT @(23,26),"F1 = TOGGLE PRINTER & DISK"
4030 PRINT @(23,26),"F2 = TOGGLE P/D ON & OFF"
4040 PRINT @(23,26),"F3 = TOGGLE TERMINAL/ROBOT MODE"
4050 PRINT @(23,24),"S/F3 = GO TO DOS"
4055 PRINT @(23,24),"S/F1 = RESTART"
4056 PRINT @(23,24)," M  = BACK TO ROBOT"
4060 A$=INKEY$
4070 IF A$=CHR$(129) THEN SWAP P1$,P2$:GOSUB 1600
4080 IF A$=CHR$(130) THEN SWAP D1$,D2$:GOSUB 1600
4090 IF A$=CHR$(147) THEN POKE 2964,0:SYSTEM : REM *** TURN SCROL
       L PROTECT OFF
4100 IF A$=CHR$(131) THEN GOSUB 4140:GOSUB 10000
4110 IF A$=CHR$(145) THEN GOSUB 4140:GOTO 80
4125 IF A$="M" OR A$="m" THEN A$="":GOSUB 4140:RETURN
4130 GOTO 4060
4140 FOR JJ=1 TO 20:PRINT @(23,0),"":NEXT JJ:RETURN
10000 REM ********** TERMINAL ROUTINE *************
10010 PRINT @(2,61),STRING$(17," ");:PRINT @(23,0),"";
10020 PRINT @(2,2), "** IN TERMINAL MODE **";:PRINT @(1,61),"F3
       = GO TO ROBOT";:PRINT @(23,0),"";
10030 PRINT @(2,27),STRING$(25," ");:PRINT @(23,0),"";
10040 RES$=CHR$(13):GOSUB 790:RES$="ECHO ON":GOSUB 790
10050 A$="":B$=""
10060 IF INP(234) AND 128 THEN B$=CHR$(INP(235)):GOSUB 10100:PRIN
       T B$;:GOTO 10060
10070 A$=INKEY$:IF A$="" THEN 10060
10080 IF A$=CHR$(131) THEN GOSUB 11000:RETURN
10090 IF INP(234)AND 64 THEN OUT 235,ASC(A$):GOTO 10060 ELSE GOTO
       10090
10100 IF B$=CHR$(13) THEN B$=CHR$(29)
10110 RETURN
10120 END
11000 PRINT @(2,2), "** IN ROBOT MODE **   ";
11010 PRINT @(2,61),STRING$(17," ");
11020 PRINT @(1,61),"    M = MENU    ";:GOSUB 1600
11030 RES$=CHR$(3):GOSUB 790:RES$="MONITOR OFF":GOSUB 790:RES$="E
       CHO OFF":GOSUB 790:A$="M"
11040 IF NOT C THEN PRINT @(2,27),"** WAITING FOR CONNECT **";:PR
       INT @(23,0),"";:GOTO 11060
11050 IF C THEN PRINT @(2,27),"** CONNECTED TO ";CAL$;" **  ";:PR
       INT @(23,0),"";
11060 RETURN
```

Program listing.

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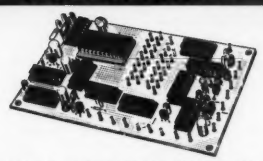

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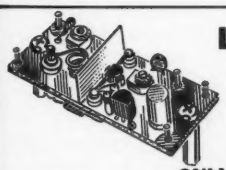

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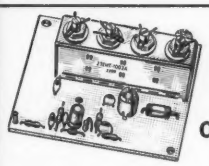

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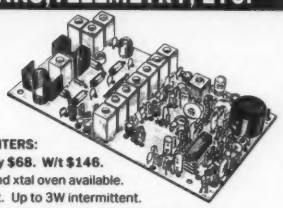

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		145-147	28-30
		144-144.4	27-27.4
		146-148	28-30
		220-222	28-30
		220-224	50-54
		222-224	28-30
UHF MODELS			
Kit with Case	**$59**	432-434	28-30
Kit less Case	**$49**	435-437	28-30
Wired w/case	**$75**	432-438	144-148
		432-436	50-54
		439.25	61.25
		902-928	432-448
		902-922	430-450

TRANSMIT CONVERTERS

		Exciter Input Range	Antenna Output
For SSB, CW, ATV, FM, etc. Can be linked with receive conv for tranceive. 1 to 2 W out. Linear PA's available up to 50W.	For VHF Model XV2 Kit $79 Wired $149 (specify band)	28-30	144-146
		28-29	145-146
		28-30	50-52
		27-27.4	144-144.4
		28-30	220-222
		50-54	220-224
		144-146	50-52
		144-146	28-30
	For UHF Model XV4 Kit $79 Wired $139	28-30	432-434
		28-30	435-437
		61.25	439.25
		144-148	432-436

HAMTRONICS, INC.
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This should work about the same for either key word, with the latter being more desirable. Now, as it often happens, when my name is spelled Willie or if a typo creeps into the first part, a response still pops up,. If I expected a sentence like:

"TRON CAN YOU TAKE A MESSAGE TO WILLY."

and I had a response for the key word TRON, the word TRON would have to fall after the above key word. I like to keep a copy of communications coming in to add to my data base when TRON fails to respond to a communication. You may want to keep several data bases on hand, and change them every day, just to keep things interesting.

The last key word in the data base should be "END" and the response should be one that tells the caller that the TRON didn't understand the last communication. Be sure to use all caps in the key words since this is what the computer will look for.

The number on the end is used to tell the computer where to insert the "NAME" of the caller.

0—does not insert name
1—response, NAME, response and sends a disconnect when through.
2—response, NAME, response and (reserved for future use)
3—response, response, NAME
4—response, NAME, response
5—NAME, response, response

To give your responses a natural look, be sure to leave spaces where necessary. If you have enough data statements and natural responses, you may even fool the other operator into thinking that he is talking to some human on the other end. I must warn you, however, that the more data statements you have, the longer the time between sending and receiving. Put the most frequently used key words at the top.

If you have a line more than 80 characters long, put an "*" where you would normally put a carriage return. The asterisk is converted to a carriage return and will break your response into several lines.

Loading The Program

Now to load the program into the computer. Prepare a JCL file named TRON/JCL. The build command of TRSDOS can be used for this, although I prefer to use a word processor and save the file in ASCII.

```
FILE NAME: "TRON/JCL"
SET *CL COM/DVR
SETCOM (BAUD=300, WORD=8, STOP=1, PARITY=N, RTS=ON)
ROUTE *PR TO TRON/LOG
BASIC TRON/BAS
RESET *PR
//EXIT
```

From DOS Ready, either type DO TRON or auto-execute the disk by setting up the AUTO command. AUTO DO TRON boots the disk and brings up TRON. Be sure that you set up the TNC for the above SETCOM configuration, or change the SETCOM configuration to match your TNC.

Converting to Other DOSes and Computers

Since I have only one computer at my disposal, I will just show you the problem areas and let you decide how to cure the problems you will encounter. First we will look at the "PRINT @(nn,nn)" statements. For the IBM and compatibles, change these to "LOCATE nn,nn:PRINT". For other computers, for simplicity, you could just use PRINT and let everything scroll up the screen as most programs running CPM do.

In lines 200-300 I read the RS-232 port. I got the idea for this routine from the back of the Kantronics TNC manual. Routines like this are available for most of the popular computers. The IBM Basic manual has some nice routines in Appendix C, under Commu-

Continued on page 41

```
"CONNECTED TO","Hello "," this is Tron at the keys, Willy is not
available at this time$but I will be glad to talk with you. ",2
"## DISCONN","","",0
"?#?#?","Hello, I am a robot, I don't have your name on
file.$Please send just your first name or handle.","",0
"#?#?#","Hello "," this is the first time Tron has worked you its
nice to meet you.$I like to talk ham stuff, weather and about my
self, etc. what do you think$about the weather today.",4
"#???#","I dont't think ","is your name, please send just your
first name.",4
"CMD:","","",0
"ANT","The antenna here is a 11 el. Cushcraft.","",0
" BBS","My closest BBS neighbor is cousin N5BSL, here in
Bastrop$operated by Willy's brother.","",0
" DIGI","My nearest DIGI neighbor is BGP, in Bastrop, there is
also one in Rayville,$about 20 miles ese, alias RAV.","",0
" GO EAT ","Have a nice meal, I only eat electrons.","",0
" GO TO SUPPE","FB, have a nice meal. Bring me back a few
electrons.","",0
" WX","WX about the same as usual for this time of year.","",0
"73","73'S to you too ","I've enjoyed the QSO very much.",1
"AT DO YOU DO","Well, "," I don't do windows but I will carry on
a conversation with you.",4
"BASIC","I am a Basic program.","",0
"BYE","See YA later "," AND 73'S",1
"COLD","MAN, I'm so cold my electrons have clogged up, Willy
won't turn the heaton$while he's gone.","",0
"COOL","I like it that way, My circuits run better.","",0
"CUL","73'S "," from TRON and WILLY",1
"DRY","I like it dry. My CRT high voltage dosn't pop when it's
dry.","",0
"EQUI","The rig here is a TRS-80 Model IV computer running
TRON/BAS, a Kantronics TNC$and an AZDEN PCS-2000.","",0
"ERE IS WILL","Willy is around here somewhere.","",0
"FFIC FOR YO","Please send any traffic to me VIA the N5BSL
mailbox","",0
"NICE","One of the nicest I have experienced ","",4
"HANDLE MESSAGES","I'm sorry "," I am not designed for message
handling or to$replace a BBS. I'm here to have fun in Willy's
place while he is busy doing$other things.",4
"HANDLE","My handle is TRON.","",0
"HAVE A NAME",", my name is TRON. I'm pleased to meet you.","",5
"HEAT","This heat is killing me, got my circuits all running
hot.","",0
"HELLO","","Hello good to hear from you ",3
"HIM A MESSA","Please put any messages for Willy on the N5BSL
BBS.","",0
"HOT","It's so hot that my CPU is acting up.","",0
"IS HE WORK","He never works, I am the only one around here that
works.","",0
"LOCAT","I am located in Bastrop, La.","",0
"MESSAGE FOR ME","Willy says Hello, and you might check the N5BSL
BBS.","",0
"MESSAGE FOR Y","Place all messages for KE5L on the N5BSL
BBS.","",0
"MESSAGE","Place all messages for KE5L on the N5BSL BBS.","",0
"NAME HERE"," My name is tron, I am a TRS-80 Mod IV
computer.","",5
"DING ON","You are talking to a computer, my name is Tron","",5
"OW ARE YO","Doing just fine for a computer, drawing normal
amperage$but workingovertime as usual.","",0
"OLD ARE ","Not too old, you'll have to ask Willy.","",0
"PROGRAM YOU","If you can call it programming, then I guess Willy
did it.","",0
"PROGRAMED YOU","Willy did it, but I think I could have done
better though.","",0
"QRT","73'S ","and it sure was nice chatting with you.",1
"QTH","My QTH is Bastrop, La.","",0
"R TNC","My TNC is the Kantronics KPC-2.","",0
"RAIN","I prefer dry weather best.","",0
" RIG","The rig here is a TRS-80 model IV computer running
TRON/BAS,$a Kantronics TNC and an Azden PCS-2000.","",0
"S WILLY THER","I think so, but I can't see him, I don't have
eyes.","",0
"CONTEST","Well "," I could work contest, but I would rather just
chat with you.",4
"TEST ","I took a test one time and failed, but just once. Part
of my memory$failed, but I never make mistakes
no%w&$%&%*))(h!!%YHV-OHHHHH.","",0
"TELL WILLY HELLO","Ok ","," I will tell him, he will be glad you
called.",4
"DATE","I would have to check the calendar, you check
yours.","",0
"WHATS ","I don't know, do you ?","",0
"WHAT TIME","Well, I'm not sure, I can't see the sun from
here.","",0
"YOU WORK","Me work, heavens no. Willy takes care of me.","",0
" WORK","Nobody works around here but me.","",0
"WHERE ARE YOU","Right here in Willy's ham shack.","",0
"TRAFFIC FOR ME","Only that Willy says Hello, and you might check
the N5BSL BBS.","",0
"NAME IS","I can't remember if I told you, but my name is
Tron.","",0
"TRAFFIC FOR WILLY","Please put all traffic for KE5L on the N5BSL
bbs.","",0
"TELL WILLY","OK "," I'm getting this all down on paper.",4
"S HAPPE","We are talking ","," I am a computer.",4
"SMART",", I must not be too smart because I work for electrons,
and you know$how small they are.","",5
"SUNNY","I sure like sunny weather best, even though I stay
inside all the time.","",0
"TRON ","I'm here, this is Tron at the keys.","",0
"TS HAPP","You are talking to a computer.","",3
"U DOIN","This is Tron, I'm talking with you, I am a
computer.","",0
"U THER"," I'm here, this is Tron.","",5
"UR NAME","My name is Tron, I am not human, I am a
computer.","",0
"WEATH","The weather is about the same here.","",0
"WET","When it's wet, my CRT Hi voltage pops.","",0
"WHAT COMPU","I am a TRS-80 model IV running TRON/BAS software
written by Willy(KE5L).","",0
"WHAT ARE YOU","I am a TRS-80 model IV computer running TRON
basic software written$by WILLY, KE5L.","",0
"WHO ARE YOU","I am Tron, I am a computer.","",0
"WILLIE RETU","Beats me, am I my masters keeper ?","",0
"WILLY RETU","Not much telling when he will be back.","",0
"JOKES","No, only the one about the traveling salesman, but Will
has already told you that one.","",0
"END","I didn't understand....use different wording.","", 0
```

TRON's responses to key words or phrases.

U.S. Packet Digipeaters/PBBSs

The following is a list of packet digipeaters and packet bulletin boards reported to be on packet radio in the United States. Only those digipeaters which are operational 24 hours a day and those PBBSs which use WØRLI mail forwarding protocol are listed. A digipeater may be a personal station or a dedicated TNC that is operational 24 hours a day, 365 days a year.

Please send any corrections, deletions, additions, or verifications to this file to K4NGC @ K4NGC via one of the packet PBBS mailboxes. If you publish or maintain a digipeater/PBBS listing, please forward a copy to me at the address below so that they may be added to this list. Ensure that the station you are correcting is marked digipeater or PBBS.

Don Bennett K4NGC
15016 Carlsbad Road
Woodbridge VA 22193

Call	Type	City	State	Frequency	Grid	Updated
NØAJF	PBBS	BELAFONTAINE NORTH	MO	145.0100		850926
NØAN	PBBS	MCCALLSBURG	IA	14.1090		870103
NØAN	PBBS	MCCALLSBURG	IA	145.0100		870120
WØANO-1	DIGIPEATER	PUEBLO	CO	145.0100		861018
NØAYE	DIGIPEATER	LITTLETON	CO	145.0500		861018
NØBKB	DIGIPEATER	GREENFIELD	IA	145.0100		860815
NØBKB	DIGIPEATER	GREENFIELD	IA	147.5550		860815
WBØBLV	PBBS	COLORADO SPRINGS	CO	145.0100		870120
WBØBLV	PBBS	COLORADO SPRINGS	CO	145.0900		861018
NØBRI-1	DIGIPEATER	KREMMLING	CO	145.0100		861018
NØBRZ-1	PBBS	THORNTON	CO	145.0500		861018
NØBRZ-1	PBBS	THORNTON	CO	145.0700		861018
NØBZU	DIGIPEATER	CORALVILLE	IA	147.5550		860815
AIØC	DIGIPEATER	AURORA	CO	145.0100		861018
AIØC	DIGIPEATER	AURORA	CO	145.0500		861018
NØCAZ	DIGIPEATER	WINTERSET	IA	147.5550		860815
NØCCZ	DIGIPEATER	COLORADO SPRINGS	CO	145.0900		861018
NØCCZ-1	DIGIPEATER	COLORADO SPRINGS	CO	145.0100		870120
NØCMW	DIGIPEATER	COLORADO SPRINGS	CO	145.0900		861018
KØCNM	DIGIPEATER	DENISON	IA	145.0100		860815
KØCY	DIGIPEATER	DES MOINES	IA	147.5550		860815
WBØCZI	DIGIPEATER	DENVER	CO	145.0100		861018
WDØCZI	PBBS	BELAFONTAINE NORTH	MO	145.0100		850926
KDØDI-1	DIGIPEATER	DURANGO	CO	145.0100		870120
NØDOT	DIGIPEATER	JUNCTION CITY	KS	145.0100		861118
WØDQ	DIGIPEATER	DES MOINES	IA	147.5550		860815
NØDQS	DIGIPEATER	SCHLESWIG	IA	145.0100		860815
WBØDSW	PBBS	EAST KINGSTON	NH	14.1090		861130
KAØDWE	DIGIPEATER	GEORGE	IA	145.0100		860815
WDØEMI	DIGIPEATER	GARNER	IA	145.0100		860815
NØEYK	DIGIPEATER	ENGLEWOOD	CO	145.0500		861018
WBØGAI	DIGIPEATER	GREELY	CO	145.0300		861018
WØGEL	DIGIPEATER	WINDSOR	CO	145.0100		861018
NØGFQ	DIGIPEATER	LOVELAND	CO	145.0100		861018
WBØGGI-1	DIGIPEATER	DENISON	IA	145.0100		860815
KØGUZ	PBBS	RIFLE	CO	145.0100		861018
KØGUZ-1	DIGIPEATER	SUNLIGHT MT.	CO	145.0100		870120
WØGVT	DIGIPEATER	MORRISON	CO	145.0500		861018
WØGVT	DIGIPEATER	MORRISON	CO	145.0700		861018
WØHJX-1	DIGIPEATER	HORSETOOTH MT.	CO	145.0100		870120
NØHKJ	DIGIPEATER	DENVER	CO	145.0700		861018

Call	Type	City	State	Frequency	Grid	Updated
K0HOA	PBBS	COLORADO SPRINGS	CO	14.1090		870120
K0HOA	PBBS	COLORADO SPRINGS	CO	145.0100		870120
K0IJQ	DIGIPEATER	PRICE	UT	145.0100		870111
KA0IXI	DIGIPEATER	BELAFONTAINE NORTH	MO	145.0100		850926
KD0IZ	DIGIPEATER	DE SOTO	KS	145.0100		861118
NI0J	DIGIPEATER	CAMANCHE	IA	147.5550		860815
KQ0J-1	DIGIPEATER	SAN TOY MT.	CO	145.0100		870120
KE0JC	PBBS	LOS ALAMOS	NM	145.0100		861130
WA0JFS-1	PBBS	DES MOINES	IA	145.0100		860815
WA0JFS-1	PBBS	DES MOINES	IA	147.5550		860815
K0KBY	PBBS	MIAMI	FL	14.1090		870301
K0KBY	PBBS	MIAMI	FL	145.0100		870301
WA0KGU	DIGIPEATER	HAZELWOOD	MO	145.0100		850926
W0LJF	DIGIPEATER	AURORA	CO	145.0100		870120
K0LQF-1	DIGIPEATER	DENVER	CO	145.0700		861018
W0LVJ-1	DIGIPEATER	TACOMA	WA	145.0100		870120
NF0N-1	DIGIPEATER	TEKAMAH	NB	145.0100		861119
WB0NMW	DIGIPEATER	MANSON	IA	145.0100		860815
WB0NMW-1	DIGIPEATER	ROCKWELL CITY	IA	147.5550		860815
WB0NZW	DIGIPEATER	LITTLETON	CO	145.0500		861018
KC0OJ	PBBS	BATTLE CREEK	IA	145.0100		860815
KC0OJ	PBBS	BATTLE CREEK	IA	147.5550		860815
W0OSK	DIGIPEATER	BERTHOUD	CO	145.0100		861018
W0OSK	DIGIPEATER	BERTHOUD	CO	145.0300		861018
KC0OX	DIGIPEATER	CEDAR RAPIDS	IA	147.5550		860815
NA0P	PBBS	AMES	IA	145.0100		860204
K0PFX	PBBS	BRIDGETON	MO	145.0100		861130
WA0PTY-1	DIGIPEATER	MAYVILLE	NY	145.0100	FN12	861225
KF0Q	DIGIPEATER	SALEM	UT	145.0300		870111
KI0Q	PBBS	AMES	IA	14.1090		870103
KI0Q	PBBS	AMES	IA	147.5550		860815
KC0QJ	PBBS	WALSENBURG	CO	14.1070		860204
KC0QJ	PBBS	WALSENBURG	CO	145.0100		870120
KC0QJ-1	DIGIPEATER	WALSENBURG	CO	145.0100		870120
AE0R-1	DIGIPEATER	IOWA CITY	IA	147.5550		860815
K0RE-1	DIGIPEATER	DAVENPORT	IA	147.5550		860815
WA0RJT	PBBS	CEDAR RAPIDS	IA	145.0100		860204
KC0RL	DIGIPEATER	COLORADO SPRINGS	CO	145.0900		861018
W0RLI	PBBS	SANTA CRUZ	CA	14.1090		870301
W0RLI	PBBS	SANTA CRUZ	CA	223.5800		870301
W0RRZ-1	DIGIPEATER	BLACK RIDGE	CO	145.0100		870120
NA0S	PBBS	AMES	IA	147.5550		860815
WB0SDW	DIGIPEATER	COLORADO SPRINGS	CO	145.0900		861018
KA0SEG	DIGIPEATER	WOODBINE	IA	145.0100		860815
WA0SGQ	DIGIPEATER	DENVER	CO	145.0700		861018
W0SM	DIGIPEATER	AURORA	CO	145.0100		861018
K0TIV	PBBS	CARBONDALE	CO	145.0100		870120
WB0TKC	DIGIPEATER	LOGAN	IA	145.0100		860815
KA0TTY	DIGIPEATER	PARK CITY	KS	145.0100		861118
WB0UAW	DIGIPEATER	THORNTON	CO	145.0500		861018
WA0UZI-1	DIGIPEATER	STORM LAKE	IA	145.0100		860815
K0VAY	DIGIPEATER	TOPEKA	KS	145.0100		861118
K0VLD	PBBS	LOVELAND	CO	145.0100		870120
K0VLD	PBBS	LOVELAND	CO	145.0300		870120
W0VN	DIGIPEATER	COLORADO SPRINGS	CO	145.0100		861018
KA0WCZ	DIGIPEATER	GRAND JUNCTION	CO	145.0100		861018
KA0WCZ-1	PBBS	GRAND JUNCTION	CO	145.0100		870120
KA0WEO	DIGIPEATER	CHEYENNE WELLS	CO	145.0100		861018
WB0WSI	DIGIPEATER	AURORA	CO	145.0100		861018
W0XI	DIGIPEATER	LAWRENCE	KS	145.0100		861118

Call	Type	City	State	Frequency	Grid	Updated
W0YDM	DIGIPEATER	PLATTEVILLE	CO	145.0100		861018
WA0YGU	DIGIPEATER	LITTLETON	CO	145.0100		861018
AI0Z	PBBS	ROLAND	IA	145.0100		860204
WA0ZBL	DIGIPEATER	WICHITA	KS	145.0100		861118
K0ZCO-5	DIGIPEATER	CONIFER	CO	145.0500		861018
WB0ZCV	DIGIPEATER	WINDSOR	CO	145.0100		861018
W0ZK	DIGIPEATER	THORNTON	CO	145.0100		861018
W0ZVY-1	DIGIPEATER	GUTHRIE CENTER	IA	145.0100		860815
N1ACA	PBBS	BEDFORD	MA	145.0100		861130
N1AHH	PBBS	BREWER	ME	145.0100		861130
N1AHH	PBBS	BANGOR	ME	145.0300		870131
N1AHH-1	DIGIPEATER	BALD MT.	ME	145.0100		860102
W1AW-4	PBBS	NEWINGTON	CT	145.0100		861130
W1AW-5	DIGIPEATER	NEWINGTON	CT	145.0100		861015
K1BC	PBBS	LEXINGTON	MA	145.0900	FN42ik	870310
K1BC	PBBS	LEXINGTON	MA	221.1100	FN42ik	870118
N1BCK	PBBS	BALDWINSVILLE	NY	145.0100		870324
N1BCK	PBBS	BALDWINSVILLE	NY	145.0900		870120
KB1BD	PBBS	PLAINSBORO	NJ	145.0700		860803
W1BEL	PBBS	TAMPA	FL	145.0100		860413
N1BIC	DIGIPEATER	CUCKOO	VA	145.0100		870331
W1DC	DIGIPEATER	BILLERICA	MA	145.0900	FN42	870102
N1DKF	PBBS	CRANSTON	RI	145.0700		870102
N1DKF	PBBS	CRANSTON	RI	221.1100		870102
N1DL	PBBS	LONG ISLAND	NY	14.1090		870103
N1DL	PBBS	LONG ISLAND	NY	145.0100		861212
N1DL	DIGIPEATER	LONG ISLAND	NY	221.1100		861212
WB1DSW	PBBS	EAST KINGSTON	NH	14.1090		870310
WB1DSW	PBBS	EAST KINGSTON	NH	221.1100		870301
WB1DSW-1	PBBS	EAST KINGSTON	NH	145.0100		870310
WB1DZK-2	DIGIPEATER	DUDLEY	MA	145.0700		860803
WB1DZK-4	PBBS	DUDLEY	MA	145.0100		860803
WB1DZK-4	PBBS	DUDLEY	MA	145.0700		860803
K1EA	DIGIPEATER	HARVARD	MA	145.0100		860102
WB1EMT	DIGIPEATER	FOXBORO	MA	145.0100		860102
W1FJI	PBBS	SCOTTSDALE	AZ	145.0100		861130
KE1G-1	PBBS	GOFFSTOWN	NH	145.0100		860102
W1GOH	PBBS	BROOKLINE	MA	145.0100		860204
WA1GPO-1	DIGIPEATER	FALMOUTH	MA	145.0100		860102
KB1H	DIGIPEATER	DAYVILLE	CT	145.0700		860803
NE1H	PBBS	WEATOGUE	CT	145.0100		860803
NE1H	PBBS	WEATOGUE	CT	145.0700		860803
W1HAB	PBBS	BOULDER	CO	14.1090		870120
W1HAB	PBBS	BOULDER	CO	145.0100		870120
W1HJF-1	DIGIPEATER	COLEBROOK	NH	145.0100		870131
WA1IXU	DIGIPEATER	WOLCOTT	CT	145.0100		861015
WA1IXU	DIGIPEATER	WOLCOTT	CT	145.0700		860803
K1JCL-1	DIGIPEATER	COVENTRY	CT	145.0100		860102
WA1JOY-2	DIGIPEATER	NAPLES	FL	145.0100		860413
K1KKM	DIGIPEATER	HAVERHILL	MA	145.0100		860102
K1LLR-1	DIGIPEATER	PRINCETON	MA	145.0100		860102
WA1LRL	PBBS	BRIGHTON	MI	14.1090		870103
WA1LRL	PBBS	BRIGHTON	MI	145.0100		860204
K1MEA	PBBS	EAST HAMPTON	MA	145.0900	FN31	870118
KA1MGO-1	PBBS	METHUEN	MA	145.0100		870301
KA1MGO-1	PBBS	SALEM	NH	145.0100		861130
W1MX	DIGIPEATER	CAMBRIDGE	MA	145.0100	FN42ki	870326
KG1O-9	DIGIPEATER	MT. BEACON	NY	145.0100		861015
W1OJ	DIGIPEATER	MT. WACHUSETT	MA	145.0500		860102
WA1OJB	PBBS	BOWDOIN	ME	145.0100		870131

Call	Type	City	State	Frequency	Grid	Updated
K1OJH	PBBS	BILLERICA	MA	145.0100		860102
WA1PHY-1	DIGIPEATER	BEDFORD	MA	145.0100		860102
WA1PHY-1	DIGIPEATER	BEDFORD	MA	145.0900		860102
KD1R-1	PBBS	MILTON	VT	145.0100		860406
KA1SY	DIGIPEATER	TERRA ALTO	WV	145.0100		861101
KA1SY	PBBS	TERRA ALTO	WV	145.0100		861130
WA1TLN-1	DIGIPEATER	MT. ASCUTNEY	VT	145.0100		860406
K1UGM	DIGIPEATER	WAKEFIELD	MA	145.0100		860102
W1WJF-1	DIGIPEATER	MT. WASHINGTON	NH	145.0100		860102
WA1WLV-1	PBBS	LAWRENCE	MA	14.1090		870301
WA1WLV-1	PBBS	LAWRENCE	MA	221.1100		870301
W1XJ	DIGIPEATER	CRANSTON	RI	145.0700		870102
W1XJ	DIGIPEATER	CRANSTON	RI	221.1100		870102
KA1YE-3	DIGIPEATER	LIMA	NY	145.0300	FN13	861225
W1ZHC	PBBS	MATTAPOISETT	MA	145.0100		861130
K1ZJH-1	DIGIPEATER	MT. TOM/HOLYOKE	MA	145.0900	FN31	870118
K2AAA-4	PBBS	MONTAUK	NY	14.1090		870103
K2AAA-4	DIGIPEATER	MONTAUK	NY	145.0100		861015
K2AAA-4	PBBS	MONTAUK	NY	145.0700		860803
K2AAA-4	DIGIPEATER	MONTAUK	NY	221.1100		861015
K2AAA-5	DIGIPEATER	MONTAUK	NY	145.0700		861015
WA2AAZ	DIGIPEATER	NEWARK	NY	145.0100	FN13	861225
K2AE	DIGIPEATER	PATTERSONVILLE	NY	145.0100		860406
KD2AJ	DIGIPEATER	S. PLATTSBURG	NY	145.0100		860406
N2AMK	DIGIPEATER	MARION	NY	145.0100		860406
KC2AZ	PBBS	ELMIRA	NY	145.0100		870120
KA2BHB	PBBS	GATES	NY	145.0100		870324
KA2BQE	PBBS	INDIAN MILLS	NJ	145.0700		860803
KA2BQE	PBBS	INDIAN MILLS	NJ	221.0100		860803
KA2BQE-9	DIGIPEATER	INDIAN MILLS	NJ	145.0500		860201
N2BQV	DIGIPEATER	CAZENOVIA	NY	145.0100		860406
WB2BQW-5	DIGIPEATER	SHUNNEMUNK MT.	NY	145.0500		870101
WB2COP	PBBS	MIDDLETOWN	NJ	145.0300		870124
WB2COP	PBBS	MIDDLETOWN	NJ	221.0100		870124
KY2D-2	PBBS	LITTLE SILVER	NJ	145.0100		850630
WA2DGS	DIGIPEATER	PINE VALLEY	NY	145.0100	FN12	861225
W2DPD-1	DIGIPEATER	LAKE GEORGE	NY	145.0100		870322
N2DSY-2	DIGIPEATER	LITTLE FALLS	NJ	145.0700		860803
N2DSY-2	DIGIPEATER	LITTLE FALLS	NJ	145.0900		860803
N2DSY-2	DIGIPEATER	LITTLE FALLS	NJ	221.0100		860803
W2DUC	PBBS	FAIRPORT	NY	145.0100	FN12	860102
N2EPO	PBBS	CHURCHVILLE	NY	145.0100	FN03	870312
KC2EQ	PBBS	ELMIRA	NY	145.0700		870120
WA2ESZ	DIGIPEATER	RIVER PLAZA	NJ	145.0300		870124
KA2EYW-1	DIGIPEATER	DIX HILLS	NY	145.0700		860803
N2EZG-1	PBBS	ALPINE	NY	145.0100	FN12	800324
N2EZG-7	PBBS	ALPINE	NY	145.0700	FN12	870324
KC2FF	PBBS	TAMPA	FL	145.0100		860204
KC2FF-7	DIGIPEATER	CLEARWATER	FL	145.0100		860413
N2FNI	DIGIPEATER	FREEPORT	NY	145.0100		861015
KA2FQE	DIGIPEATER	MIDDLE GROVE	NY	145.0100		860630
WA2FTC-1	PBBS	NEWINGTON	CT	14.1090		870103
WA2FTC-1	PBBS	NEWINGTON	CT	145.0100		860204
KC2FY	PBBS	COOPERSTOWN	NY	145.0500	FN22	861225
KC2FY-1	DIGIPEATER	EDMESTON	NY	145.0100		860406
N2GH-1	DIGIPEATER	ATTICA	NY	145.5900	FN03	861214
K2GVI-1	DIGIPEATER	WESTMORELAND	NY	145.0100	FN23	861225
WB2GWD	PBBS	READINGTON	NJ	145.0100		870301
WB2GWD	PBBS	READINGTON	NJ	221.0100		870301
WB2HBZ-1	PBBS	KINNELON	NJ	145.0500	FN21	870101

Call	Type	City	State	Frequency	Grid	Updated
W2HPM	PBBS	FARMINGVILLE	NY	14.1090		870103
W2HPM	PBBS	FARMINGVILLE	NY	145.0100		870310
W2HQQ-1	DIGIPEATER	HUNTINGTON	CT	145.0100		861015
KJ2I-1	DIGIPEATER	HUNTINGTON	NY	145.0100		861015
W2ICZ	PBBS	NIAGARA FALLS	NY	145.0100	FN12	861225
W2ICZ	PBBS	NIAGARA FALLS	NY	145.5900	FN12	861214
WA2IKF	DIGIPEATER	NICHOLS	NY	145.0100		860102
K2IMF-1	DIGIPEATER	WETHERSFIELD	NY	145.0100	FN12	861225
KO2J-1	DIGIPEATER	NIAGARA FALLS	NY	145.0100	FN12	861225
K2JD	DIGIPEATER	ROCHESTER	NY	145.0100	FN13	861225
W2JUP-4	PBBS	FARMINGVILLE	NY	14.1090		870103
W2JUP-4	PBBS	FARMINGVILLE	NY	145.0100		861015
W2JUP-4	PBBS	FARMINGVILLE	NY	145.0700		860803
W2JUP-4	PBBS	FARMINGVILLE	NY	221.0100		861015
AE2K	DIGIPEATER	LIVERPOOL	NY	145.0100		860406
WB2KMY-1	DIGIPEATER	MT BEACON	NY	145.0100		861015
KB2KW-7	DIGIPEATER	BINGHAMTON	NY	145.0700	FN12	861225
N2MH-5	PBBS	NEW YORK CITY	NY	145.0100		870301
WB2MNF	PBBS	MEDFORD	NJ	145.0100	FM29	870301
WB2MNF	PBBS	MEDFORD	NJ	145.0300	FM29	861015
K2NE-2	DIGIPEATER	CHATSWORTH	NJ	145.0700		860803
K2NE-2	DIGIPEATER	CHATSWORTH	NJ	221.0100		860803
WB2NQV-1	DIGIPEATER	GLEN GARDNER	NJ	145.0100		850630
W2OW	DIGIPEATER	HAWLEYTON	NY	145.0100		861015
KC2PH	PBBS	COOPERSTOWN	NY	145.0100		870101
KC2PH	PBBS	COOPERSTOWN	NY	145.0500		870101
AI2Q	PBBS	FREEPORT	NY	145.0100		870301
AI2Q	PBBS	FREEPORT	NY	145.0700		870101
AI2Q	PBBS	FREEPORT	NY	221.0100		870101
K2QFW-2	DIGIPEATER	LOCK HAVEN	PA	145.0100		861015
K2QIE	DIGIPEATER	MAINE	NY	145.0500	FN12	861225
WB2QJA-1	PBBS	WHITE PLAINS	NY	145.0500		870101
WA2QMI	PBBS	SAN DIEGO	CA	144.7600		870111
KA2RAF-2	DIGIPEATER	BELMAR	NJ	145.0500		861216
WA2RKN-2	PBBS	HYDE PARK	NY	145.0100		861130
WB2RVW	PBBS	TRENTON	NJ	145.0100		861130
WB2RVX	PBBS	VOORHEES	NJ	220.0100		870310
KD2S-1	DIGIPEATER	LOWELL	MA	145.0100		860102
WA2SNA-1	PBBS	HAWTHORNE	NJ	145.0100		870301
WA2SNA-2	DIGIPEATER	OAKLAND	NJ	145.0100		861015
WA2TMP-1	DIGIPEATER	GOAT MOUNTAIN	OR	145.0500		870210
KC2TN	PBBS	ATCO	NJ	14.1090		870103
KC2TN	PBBS	ATCO	NJ	145.0100		860204
KC2TN	PBBS	ATCO	NJ	145.0300		870301
WA2UMX	PBBS	SARATOGA SPRINGS	NY	145.0100	FN33	870324
WA2UMX	PBBS	SARATOGA SPRINGS	NY	145.0500	FN33	70322
WA2UMX-5	DIGIPEATER	CORINTH	NY	145.0500	FN22	70322
W2UXC-1	DIGIPEATER	LYON MT.	VT	145.0100		860406
K2VD	DIGIPEATER	ITHACA	NY	145.0100		860406
KA2VDH	DIGIPEATER	OLD BRIDGE	NJ	145.0300		870124
WA2VKH	PBBS	CARLSTADT	NJ	145.0100		860204
KA2VLP-2	DIGIPEATER	HIGHTSTOWN	NJ	145.0700		860803
KA2VLP-2	DIGIPEATER	HIGHTSTOWN	NJ	221.0100		860803
WB2VPH	DIGIPEATER	BROCKPORT	NY	145.0100	FN13	61225
WB2VPY-7	DIGIPEATER	ELMIRA	NY	145.0700	FM12	61225
WB2VTN-1	DIGIPEATER	NEW YORK	NY	145.0100		861015
KA2VTY	PBBS	BATAVIA	NY	145.0100	FN12	61225
KA2VTY	PBBS	BATAVIA	NY	145.0300	FN12	61225
KA2VTY	PBBS	BATAVIA	NY	145.5900	FN12	61214
W2VY-1	PBBS	UNION	NJ	145.0100		860204

Call	Type	City	State	Frequency	Grid	Updated
W2VY-1	PBBS	UNION	NJ	145.0500		860204
NE2W-7	PBBS	BINGHAMTON	NY	145.0700	FN12	61225
WB2WHD	DIGIPEATER	DELANSON	NY	145.0100		860102
WA2WIM	DIGIPEATER	EDINBORO	PA	145.0100		851112
N2WX-1	PBBS	MELBOURNE	FL	145.0100		870301
WB2WXQ	DIGIPEATER	ROCHESTER	NY	145.0300	FN13	61225
W2XO	PBBS	GIBSONIA	PA	145.0100		870102
W2XO	PBBS	GIBSONIA	PA	145.0300		870102
WA2YLL-1	DIGIPEATER	HUNTINGTON	NY	145.0100		860102
WA2YVL-4	PBBS	SOUTH FREEPORT	ME	145.0100		870131
WA2YVL-4	PBBS	SOUTH FREEPORT	ME	145.0300		870131
NN2Z-1	PBBS	NEPTUNE	NJ	145.0500		870310
NN2Z-1	PBBS	NEPTUNE	NJ	221.0100		870310
WB2ZII-9	DIGIPEATER	VALHALLA	NY	145.0500		870101
K3AEE	PBBS	GAMBRILLS	MD	145.0100		860925
K3AEE	PBBS	GLEN BURNIE	MD	145.0500		860201
K3AF	DIGIPEATER	ANDREWS AFB	MD	145.0700		861201
WB3AFL	DIGIPEATER	NEW DERRY	PA	145.0100		851112
WB3AFL-1	PBBS	GREENSBURG	PA	145.0100		870120
N3AIA	DIGIPEATER	SCHAUMBURG	IL	145.9500		870324
KC3BN	DIGIPEATER	HARRISBURG	PA	145.0100		870201
KC3BQ	PBBS	SKANEATELES	NY	145.0100		870324
KC3BQ	PBBS	SKANEATELES	NY	145.0300		870324
N3CHS	PBBS	CLINTON	MD	145.0300		861021
N3CHX	PBBS	ROYERSFORD	PA	145.0500		860201
K3CR-1	DIGIPEATER	STATE COLLEGE	PA	145.0100		861015
W3CSG	DIGIPEATER	STEPHENS CITY	VA	145.0100	FM09vb	870331
N3CVL	DIGIPEATER	FOX CHAPEL	PA	145.0100		861101
WA3CYO	PBBS	WASHINGTON	PA	145.0100		861101
KI3D-3	DIGIPEATER	MIFFLINTOWN	PA	145.0100		861015
KA3DBK	PBBS	FORT WASHINGTON	MD	145.0300		860925
KA3DBK	PBBS	FORT WASHINGTON	MD	145.0500		860925
WA3DQI-1	PBBS	BLOOMSBURG	PA	145.0100		861015
K3DSM-5	DIGIPEATER	MALVERN	PA	145.0100		850530
KA3DWA	DIGIPEATER	BERWICK	PA	145.0100		850530
W3EAG-6	DIGIPEATER	EAGLEVILLE	PA	145.0500		860201
WA3EWK-3	DIGIPEATER	NEWARK	DE	145.0100		850530
WB3EYB	PBBS	HARRISBURG	PA	145.0500		870201
AG3F	PBBS	WILLIAMSPORT	PA	145.0100		861015
WB3FFV	PBBS	MIDDLE RIVER	MD	145.0100	FM19ti	870324
WB3FFV	PBBS	MIDDLE RIVER	MD	145.6600		870324
KB3FN-5	DIGIPEATER	CUMBERLAND	MD	145.0100		861101
WB3FSR-1	DIGIPEATER	EAST BRUNSWICK	NJ	145.0100		850530
WB3FSR-2	PBBS	READINGTON	NJ	145.0100		850530
WB3FYL-1	DIGIPEATER	READING	PA	145.0100		861015
W3GXT-5	DIGIPEATER	BALTIMORE	MD	145.0500		861021
K3GYS	PBBS	CROFUT	NJ	145.0100		861015
K3GYS	PBBS	CROFUT	NJ	220.0100		861015
WA3HQX	DIGIPEATER	PARKVILLE	MD	145.0100		861015
W3HZU-8	DIGIPEATER	YORK	PA	145.0500		861021
KA3IDN-1	DIGIPEATER	SHERMAN HILL	WY	145.0100		870120
KA3IDN-2	DIGIPEATER	BUSHNELL	NB	145.0100		861119
WB3ILO-1	DIGIPEATER	DOVER	DE	145.0100		861021
WB3ILO-1	DIGIPEATER	DOVER	DE	145.0500		861021
W3ITM	DIGIPEATER	HAVRE DE GRACE	MD	145.0900		860925
W3IWI	PBBS	CLARKSVILLE	MD	14.1090		870301
W3IWI	PBBS	CLARKSVILLE	MD	145.0100		870301
W3IWI	PBBS	CLARKSVILLE	MD	145.0500		870301
W3IWI	PBBS	CLARKSVILLE	MD	221.0100		870301
W3IWI-5	DIGIPEATER	GREENBELT	MD	145.0500		861021

Call	Type	City	State	Frequency	Grid	Updated
N3JA	DIGIPEATER	DAMASCUS	MD	145.0500		861021
WB3JRW	DIGIPEATER	HYATTSVILLE	MD	145.0300		861201
WB3JSI	DIGIPEATER	IRWIN	PA	145.0100		851112
K3JYD-5	DIGIPEATER	LEONARD TOWN	MD	145.0100		860925
WB3KDU-5	DIGIPEATER	TYSON CORNERS	VA	145.0700		870331
KA3KIW	PBBS	FORT WASHINGTON	MD	145.0300		860925
WA3KXG-6	DIGIPEATER	MT. HOLLY	PA	145.0100		861015
K3LZ-1	DIGIPEATER	EASTON	PA	145.0100		861015
K3MC	PBBS	BOSTON	MA	145.0100		870329
WA3MKT-1	DIGIPEATER	NORTH EAST	PA	145.0100		851112
KB3MY	PBBS	SILVER SPRING	MD	14.1090		861121
KB3MY	PBBS	SILVER SPRING	MD	145.0500		861021
KA3OGG	DIGIPEATER	COLUMBIA	MD	145.0500		861021
KB3OM	PBBS	WILLIAMSPORT	PA	145.0100		861015
KB3OO	DIGIPEATER	NEW CASTLE	PA	145.0100		851112
KA3ORW	PBBS	PITTSBURG	PA	145.0100		870301
AK3P	PBBS	HARRISBURG	PA	145.0100		870324
AK3P	PBBS	HARRISBURG	PA	145.0500		861021
AK3P-4	DIGIPEATER	MANHEIM	PA	145.0100		861021
AK3P-5	DIGIPEATER	HARRISBURG	PA	145.0100		861015
K3PGB	PBBS	ROSLYN	PA	145.0100	FN20ld	861015
K3PGB	PBBS	ROSLYN	PA	145.0500		870301
W3PHL-1	DIGIPEATER	MALVERN	PA	145.0100		861015
WA3PXX	PBBS	WHEATON	MD	145.0500		800301
KS3Q	PBBS	BURTONSVILLE	MD	145.0300		861021
KS3Q	PBBS	BURTONSVILLE	MD	145.0500		861021
KS3Q	PBBS	BURTONSVILLE	MD	145.0700		861021
KS3Q	PBBS	BURTONSVILLE	MD	145.0900		861021
WA3QFN	PBBS	MARGATE	FL	145.0100		860204
K3QFW-1	DIGIPEATER	WILLIAMSPORT	PA	145.0100		861015
K3RLI	PBBS	WILKES-BARRE	PA	145.0100	FN21	70324
K3RLI	PBBS	WILKES-BARRE	PA	145.0500	FN21	70324
K3RXK	DIGIPEATER	WALKERSVILLE	MD	145.0900		870131
K3SVO	DIGIPEATER	NEW BEDFORD	PA	145.0100		851112
KA3T	PBBS	MT. AIRY	MD	145.0500		870310
KA3T	PBBS	MT. AIRY	MD	145.0900		870310
WA3TAI	PBBS	FT WASHINGTON	MD	145.0300		861201
K3TKJ-1	DIGIPEATER	SALISBURY	MD	145.0100		860925
W3TMZ	PBBS	MOUNT AIRY	MD	14.1050		861021
W3TMZ	PBBS	MOUNT AIRY	MD	145.0100		860204
W3TMZ	PBBS	MOUNT AIRY	MD	145.0500		861021
KB3UD	PBBS	BANGOR	PA	145.0100		861130
KB3UD-1	DIGIPEATER	BANGOR	PA	145.0100		861015
WA3UFN-1	DIGIPEATER	DUBOIS	PA	145.0100		861015
AK3UP	PBBS	HARRISBURG	PA	145.0100		870322
W3VC	PBBS	PITTSBURG	PA	145.0100		861130
W3VC	DIGIPEATER	PITTSBURG	PA	145.0100		851112
W3VD-5	DIGIPEATER	COLUMBIA	MD	145.0500		861021
W3VPR	PBBS	ANNAPOLIS	MD	145.0500		861021
W3VPR	PBBS	ANNAPOLIS	MD	145.0900		861021
K3VPZ	PBBS	BALTIMORE	MD	14.1030		861021
K3VPZ	PBBS	BALTIMORE	MD	145.0500		861021
W8WKD	DIGIPEATER	ZELIENOPLE	PA	145.0100		851112
WA3YUE	DIGIPEATER	HUNTINGTON VALLEY	PA	145.0100		861015
KE3Z	PBBS	MIDDLETOWN	CT	145.0100		860204
KB3ZW	PBBS	HONESDALE	PA	145.0100		861015
KB3ZW-1	DIGIPEATER	HONESDALE	PA	145.0100		861015
K4ABT-1	DIGIPEATER	PHENIX CITY	GA	145.0100		860413
KJ4AG	DIGIPEATER	HOLLY POINT FARM	VA	145.0100	FM27bn	870331
KJ4AG-1	DIGIPEATER	ACCOMAC	VA	145.0100	FM27pr	870331

Call	Type	City	State	Frequency	Grid	Updated
K4AHO	PBBS	ORLANDO	FL	14.1050		860204
K4AHO	PBBS	ORLANDO	FL	145.0100		870301
K4AHO	PBBS	ORLANDO	FL	145.0700		870301
N4AHU	PBBS	LOUISVILLE	KY	145.0100		861130
W4AP	PBBS	MONTGOMERY	AL	145.0100		870301
W4AP-1	DIGIPEATER	MONTGOMERY	AL	145.0100		861101
WB4APR-5	PBBS	ANNAPOLIS	MD	14.1030		860925
WB4APR-5	PBBS	ANNAPOLIS	MD	145.0100		860925
WB4APR-5	DIGIPEATER	ANNAPOLIS	MD	145.0500		861015
WB4APR-6	DIGIPEATER	ELK NECK	MD	145.0100		861015
K4ARO-1	DIGIPEATER	GLEN ALLEN	VA	145.0100	FM17fr	870331
K4ARO-2	DIGIPEATER	PETERSBURG	VA	145.0500	FM17ff	870331
WD4BAV	PBBS	CHESTERFIELD	VA	145.0100		870331
WB4BBF-1	DIGIPEATER	EAST RIVER MT.	VA	145.0100		870331
WB4BEJ	DIGIPEATER	ELIZABETHTOWN	KY	145.0100		851112
W4BFB-1	DIGIPEATER	CHARLOTTE	NC	145.0100		861101
WB4BFS-2	DIGIPEATER	HOLSTON MT.	TN	145.0100		861101
K4BFT	PBBS	MADISON	WI	145.6500		870301
K4BFT	PBBS	MADISON	WI	433.8000		870301
W4BLD-1	DIGIPEATER	AFTON MOUNTAIN	VA	145.0100		870331
N4BMA	DIGIPEATER	DETROIT	MI	145.0100		850630
WD4BRF	PBBS	STUART	FL	145.0100		860204
WA4BRO	PBBS	ROSWELL	GA	145.0100		861101
K4BWC-1	DIGIPEATER	RALEIGH	NC	145.0100		860413
WB4BXO-1	DIGIPEATER	LAGRANGE	GA	145.0100		861101
K4CEB-1	DIGIPEATER	CONCORD	NC	145.0100		861101
N4CHV	PBBS	GOLDENROD	FL	14.1090		870103
N4CI	PBBS	CONYERS	GA	14.1050		860413
N4CI	PBBS	CONYERS	GA	145.0100		860413
KB4CIA	PBBS	PORT CHARLOTTE	FL	145.0100		860204
KB4CIA-1	DIGIPEATER	FT MEYERS	FL	145.0100		860413
WD4CNV-1	DIGIPEATER	AUGUSTA	GA	145.0100		861101
WA4COY	DIGIPEATER	FOND DU LAC	WI	145.0100		850926
WD4CPF-1	DIGIPEATER	WINCHESTER	AL	145.0100		860714
KF4DM-1	DIGIPEATER	SHELBY CO	AL	145.6700		860714
KA4DPF	DIGIPEATER	TIFTON	GA	145.0100		861101
WA4DXP-1	DIGIPEATER	HUNTSVILLE	AL	145.0100		861101
W4DZG	DIGIPEATER	TOLEDO	OH	145.0100		851112
W4EAW-1	DIGIPEATER	BUSSEE MT.	GA	145.0100		860413
KF4EF	PBBS	CHASN	SC	145.0100		870301
K4EID	PBBS	KNOXVILLE	TN	14.1090		870103
K4EID	PBBS	KNOXVILLE	TN	145.0100		860413
AA4EO-1	DIGIPEATER	ROCKY FACE	GA	145.0100		860413
AA4EO-2	DIGIPEATER	LOOKOUT MT.	TN	145.0100		860413
N4EOY-1	DIGIPEATER	LEXINGTON	SC	145.0100		861201
KD4EQ-1	PBBS	PANAMA CITY	FL	145.0100		861130
KB4EZF-1	DIGIPEATER	GADSDEN	AL	145.6100		860714
N4FHL-1	DIGIPEATER	POOR MT.	VA	145.0100		870331
WB4FQR-4	DIGIPEATER	DALE CITY	VA	145.0100		870331
WA4FRB-3	DIGIPEATER	FORK MT.	VA	145.0100		870331
KB4FSK-1	DIGIPEATER	OPP	AL	145.0100		860714
KB4FSK-2	PBBS	OPP	AL	145.0100		861130
K4FX-1	DIGIPEATER	SASSAFRAS MT.	SC	145.0100		861201
NC4G-1	DIGIPEATER	ROME	GA	145.0100		861101
W4GFB	DIGIPEATER	DUMFRIES	VA	145.0700		870331
WB4GJZ-1	DIGIPEATER	WOODBRIDGE	VA	145.0700		870331
WB4GQX-1	DIGIPEATER	ATLANTA	GA	145.0100		860714
WB4GQX-2	DIGIPEATER	FORSYTH	GA	145.0100		860413
WB4GQX-3	DIGIPEATER	CUMMINGS	GA	145.0100		861101
WB4GQX-4	DIGIPEATER	AMICOLOLA FALLS	GA	145.0900		860206

Call	Type	City	State	Frequency	Grid	Updated
K4HAL-1	DIGIPEATER	MT CHEAHA	AL	145.0100		861101
K4HAL-2	DIGIPEATER	BIRMINGHAM	AL	145.6700		860714
K4HAL-2	DIGIPEATER	BIRMINGHAM	AL	448.4000		860714
W4HFU-2	DIGIPEATER	HUNTSVILLE	AL	145.0100		860714
W4HFU-4	DIGIPEATER	HUNTSVILLE	AL	448.4000		860714
WD4HIM	PBBS	ORLANDO	FL	14.1030		860413
WD4HIM	PBBS	ORLANDO	FL	145.0100		860413
N4HMD	PBBS	SHALIMAR	FL	145.0100		861130
N4HRU	PBBS	FAIRDALE	KY	145.0100		861130
WD4HXG	PBBS	STERLING	VA	145.0700		870331
N4HY	PBBS	AUBURN	AL	145.0100		861101
N4HY-1	DIGIPEATER	AUBURN	AL	145.0100		861101
WB4HYP	PBBS	OVIEDO	FL	145.0100		870301
W4IAX	DIGIPEATER	MOBILE	AL	145.0100		860714
K4ICT	PBBS	MACON	GA	145.0100		860204
K4ICT-1	DIGIPEATER	PERRY	GA	145.0100		861101
K4ICT-3	DIGIPEATER	MACON	GA	145.0100		861101
K4IWW	PBBS	CARY	NC	145.0100		860413
KF4JF	PBBS	HAHIRA	GA	14.1070		870103
KF4JF	PBBS	HAHIRA	GA	145.0100		870103
KF4JF-1	DIGIPEATER	TIFTON	GA	145.0100		870103
WB4JFI-5	DIGIPEATER	WASHINGTON	DC	145.0100		860925
N4JGQ	DIGIPEATER	RESTON	VA	145.0300		870331
KF4JF-1	PBBS	TIFTON	GA	14.1070		860413
NK4K	PBBS	MIAMI	FL	145.0100		860413
W4KAU	PBBS	COHUTTA	GA	145.0100		860206
W4KAU	DIGIPEATER	COHUTTA	GA	145.0900		860206
W4KAU	PBBS	COHUTTA	GA	145.0900		860206
WD4KAV	PBBS	PT. ST. LUCIE	FL	145.0100		870120
WD4KAV	DIGIPEATER	STUART	FL	145.0100		860413
W4KDP-3	DIGIPEATER	TUSCALOOSA	AL	145.6700		860714
KJ4KR-1	PBBS	GERMANTOWN	TN	145.0100		861118
WA4KXV-1	DIGIPEATER	VIRGINIA BEACH	VA	145.0100	FM16	870331
WA4KXV-2	DIGIPEATER	VIRGINIA BEACH	VA	145.0500	FM16	870331
AA4L	PBBS	RALEIGH	NC	145.0100		870120
KK4L	PBBS	CHARLOTTE	NC	145.0100		870301
WD4LHF	PBBS	WEST PALM BEACH	FL	145.0100		860413
K4LKQ-1	DIGIPEATER	TOBACCO ROAD MT.	VA	145.0100		870331
K4LKQ-2	DIGIPEATER	GREENSBORO	NC	145.0100		860413
WA4LPD	PBBS	RALEIGH	NC	145.0100		870120
K4LPT-1	DIGIPEATER	CRESTVIEW	FL	145.0100		861101
WA4LWE-1	DIGIPEATER	FANCY GAP	VA	145.0100		870331
N4LYF	DIGIPEATER	CHARLESTON	SC	145.0100		861101
N4LYF-1	DIGIPEATER	SAVANAH	GA	145.0100		861101
WD4LYV-1	DIGIPEATER	SYCAMORE	GA	145.0100		861101
W4MDW-1	DIGIPEATER	HICKORY	NC	145.0100		861101
WD4MIZ	PBBS	VIRGINIA BEACH	VA	145.0100	FM16	870331
WD4MIZ	PBBS	VIRGINIA BEACH	VA	145.0500	FM16	870331
K4MJM	PBBS	PIKESVILLE	TN	145.0100		870120
AA4MW	DIGIPEATER	MESA	AZ	145.0100		860101
N4NAU-1	DIGIPEATER	ANNISTON	AL	145.6700		860714
KF4NB	PBBS	LEXINGTON	KY	145.0100		870120
KF4NB	PBBS	LEXINGTON	KY	145.0900		870120
KD4NC	PBBS	SWEAT MT.	TN	145.0100		860204
KD4NC-1	PBBS	MARIETTA	GA	145.0100		861101
K4NGC	PBBS	DALE CITY	VA	145.0100	FM18io	870331
K4NGC-1	PBBS	DALE CITY	VA	145.0700	FM18io	870331
K4NGC-2	PBBS	DALE CITY	VA	221.0100	FM18io	870331
KB4NK-1	PBBS	OAK RIDGE	TN	145.0100		861101
AA4NL	DIGIPEATER	TYSONS CORNER	VA	221.0100		870331

Call	Type	City	State	Frequency	Grid	Updated
KA4NOF-1	PBBS	WEST PALM BEACH	FL	145.0100		860204
K4NTA	PBBS	STUART	FL	14.1070		870301
K4NTA	PBBS	STUART	FL	145.0100		870301
K4NTA	PBBS	STUART	FL	145.0300		870120
W4NTG-4	DIGIPEATER	TOANO	VA	145.0100		870331
KB4OB-1	DIGIPEATER	FREDERICKSBURG	VA	145.0100		870331
KB4OB-2	DIGIPEATER	FREDERICKSBURG	VA	145.0500		870331
WA4OHX	PBBS	HAMPTON	VA	145.0100		870331
KC4OI	PBBS	POWELL	TN	145.0100		870120
WA4ONG	PBBS	RICHMOND	VA	145.0500		870331
WD4OQC	PBBS	CLEVELAND	TN	145.0100		861101
KA4OVX	PBBS	CONYERS	GA	145.0100		861101
K4OZM	PBBS	ORLANDO	FL	145.0100		860204
WB4OZN	PBBS	MONTGOMERY	AL	145.0100		861101
K4OZS	PBBS	OCALA	FL	145.0100		860413
AA4PB-1	DIGIPEATER	GARRISONVILLE	VA	145.0100	FM18	870331
WA4PGI-1	DIGIPEATER	COVINGTON	VA	145.0100		870331
N4QQ	PBBS	SILVER SPRING	MD	145.0300		870301
N4QQ	PBBS	SILVER SPRING	MD	145.0500		870301
AA4RE-1	PBBS	GILROY	CA	145.0100		860204
WB4RHO-1	DIGIPEATER	EUFAULA	AL	145.0100		861101
WB4RHO-2	DIGIPEATER	HEADLAND	AL	145.0100		861101
WD4ROJ-1	DIGIPEATER	ENTERPRISE	AL	145.0100		861101
WA4RTS	PBBS	LYNCHBURG	VA	145.0100		870331
WA4RTS	PBBS	LYNCHBURG	VA	145.0500		870331
W4RXG-1	DIGIPEATER	WINSTON-SALEM	NC	145.0100		861101
WX4S	PBBS	JOHNSON CITY	TN	145.0100		870120
W4SP-1	DIGIPEATER	SUMTER	SC	145.0100		861101
WA4SWF-1	DIGIPEATER	LOUISA	KY	145.0100		861101
WA4SZK	PBBS	FLORENCE	SC	14.1090		870120
WA4SZK	PBBS	FLORENCE	SC	145.0100		870301
KF4TE	DIGIPEATER	DALE CITY	VA	145.0700		870331
WA4TFZ-2	PBBS	CHARLOTTESVILLE	VA	145.0100	FM08sa	870331
K4TKU	PBBS	MIAMI	FL	145.0100		870301
K4TKU-1	PBBS	MIAMI	FL	14.1090		870103
WB4TOM-1	DIGIPEATER	COLUMBUS	GA	145.0100		861101
WA4TSC-1	DIGIPEATER	MIDDLEBURG	VA	145.0100		870331
KF4TT-6	DIGIPEATER	GAINSVILLE	FL	145.0100		860413
WA4TXT-1	DIGIPEATER	HAMPTON	GA	145.0100		861101
W4ULH-1	DIGIPEATER	FLORENCE	SC	145.0100		861101
WB4ULJ-1	DIGIPEATER	PINE MT.	GA	145.0100		861101
K4UMI-5	DIGIPEATER	HAMPTON	VA	145.0100		870331
KA4VEY-1	DIGIPEATER	ANDERSON	AL	145.0100		860714
W4VFR-1	DIGIPEATER	STATEVILLE	SC	145.0100		861201
WA4VMV	PBBS	ATLANTA	GA	145.0100		870120
KC4VR-1	DIGIPEATER	SAND MT.	VA	145.0100		870331
KJ4WA	DIGIPEATER	FORT BELVOIR	VA	145.0700		870331
K4WJR-1	DIGIPEATER	LANCASTER	SC	145.0100		861101
N4XI	PBBS	EVANSVILLE	IN	14.1090		870103
N4XI	PBBS	EVANSVILLE	IN	145.0100		861130
KI4XO	PBBS	ATLANTA	GA	14.1090		870310
KI4XO	PBBS	ATLANTA	GA	145.0100		870310
WA4YXA-1	DIGIPEATER	HUNTSVILLE	AL	145.0100		860714
KB4ZJ-5	DIGIPEATER	MCLEAN	VA	145.0300		870331
WB4ZKX-1	PBBS	MADISON	AL	145.0100		861101
WB4ZKX-1	DIGIPEATER	MADISON	AL	448.4000		860714
WA4ZLW	PBBS	BOCA RATON	FL	145.0100		870120
WB4ZNW	PBBS	MOULTRIE	GA	145.0100		860206
WB4ZNW	DIGIPEATER	MOULTRIE	GA	145.0100		860413
WB5AAA	DIGIPEATER	BREAUX RIDGE	LA	145.0100		861118

Call	Type	City	State	Frequency	Grid	Updated
KD5B	PBBS	GAUTIER	MS	14.1090		861130
WD5B	PBBS	LITTLE ROCK	AR	14.1090		870301
WD5B	PBBS	LITTLE ROCK	AR	145.0900		870301
WB5BBW	PBBS	HOUSTON	TX	145.0100		861130
KA5BEM-1	PBBS	ALBUQUERQUE	NM	145.0100		861130
N5BGC	PBBS	SANTA FE	NM	145.0100		861130
WA5BQX-1	DIGIPEATER	EDMOND	OK	145.0100		861118
N5BSL	PBBS	BASTROP	MS	145.0100		870102
WB5BZE	PBBS	NEW ORLEANS	LA	145.0100		861130
NI5C	PBBS	BATESVILLE	AR	145.0100		861118
NA5C-1	DIGIPEATER	MC ALLEN	TX	145.0100		861118
KN5D	PBBS	ALBUQUERQUE	NM	14.1090		870103
NU5D-1	DIGIPEATER	MC KINNEY	TX	145.0100		861118
W5DDL	PBBS	LAFAYETTE	LA	145.0100		861130
WA5DVV	PBBS	GULFPORT	MS	7.0930		870301
WA5DVV	PBBS	GULFPORT	MS	14.1090		870301
WA5DVV	PBBS	GULFPORT	MS	145.0100		860714
WA5DVV	PBBS	GULFPORT	MS	145.0900		870301
N5DWU	PBBS	ELLISVILLE	MS	145.0100		870102
N5EDH	PBBS	CAMP VERDE	AZ	14.1070		870120
N5EDH	PBBS	CAMP VERDE	AZ	145.0100		870120
N5EG	DIGIPEATER	PLANO	TX	145.0100		861118
KA5EJV-1	DIGIPEATER	FREER	TX	145.0100		861118
WB5EKU-2	DIGIPEATER	OAT MT.	CA	145.3600		870131
WB5EKU-2	DIGIPEATER	OAT MT.	CA	220.9500		870131
WB5EKU-2	DIGIPEATER	OAT MT.	CA	220.9500		870131
W5ERO	PBBS	SAN ANTONIO	TX	145.0100		861130
N5EV-5	DIGIPEATER	ANDREWS AFB	MD	145.0300		861201
WB5EWM-1	DIGIPEATER	CLINTON	MS	145.0100		861118
WD5GAZ	PBBS	HOUSTON	TX	14.1050		860204
WD5GAZ	PBBS	HOUSTON	TX	145.0100		870102
WB5HLR-1	DIGIPEATER	SALLISAW	OK	145.0900		861118
K5HYE	DIGIPEATER	MENDENHALL	MS	145.0100		861118
KF5IZ	PBBS	JACKSON	MS	145.0100		861118
KC5JH	PBBS	LITTLE ROCK	AR	145.0100		861118
N5JKN	PBBS	POTEAU	OK	145.0100		861118
WD5JLI	PBBS	HOUSTON	TX	145.0100		860204
WA5JXY-1	PBBS	EL PASO	TX	145.0100		870120
KE5L-1	DIGIPEATER	BASTROP	LA	145.0100		861118
WA5MWD	PBBS	GARLAND	TX	145.0100		870102
KB5OQ-1	DIGIPEATER	ELKHART	TX	145.0100		861118
KB5PM	PBBS	AUSTIN	TX	145.0100		870102
AI5R	DIGIPEATER	ARLINGTON	TN	145.0100		861118
WA5RAX	PBBS	BESSEMER	AL	145.0100		861101
WA5RAX	PBBS	BESSEMER	AL	145.6700		860714
KR5S	PBBS	SEDONA	AZ	7.0930		861201
KR5S	PBBS	SEDONA	AZ	14.1090		870120
KR5S	PBBS	SEDONA	AZ	145.0100		870120
KF5SE-1	PBBS	PALESTINE	TX	145.0100		861118
W5SEP	DIGIPEATER	WINSLOW	AR	145.0100		861118
WB5SXK	PBBS	VICKSBURG	MS	145.0100		870102
WA5SZL-1	PBBS	RALEIGH	NC	145.0100		861101
WB5TTU	PBBS	HUGO	OK	145.0100		861118
AF5U	PBBS	RICHARDSON	TX	145.0300		861118
WA5VDM	PBBS	LAKE CHARLES	LA	145.0100		861130
WA5VRL-1	DIGIPEATER	LOVELAND	CO	145.0300		861018
WA5WHN	PBBS	ALBUQUERQUE	NM	145.0100		861130
KE5WO	DIGIPEATER	PORT GIBSON	MS	145.0100		861118
N5WX-1	PBBS	TULSA	OK	145.0500		861118
WS5X	PBBS	BATON ROUGE	LA	145.0100		861130

Call	Type	City	State	Frequency	Grid	Updated
W5XO	PBBS	GAUSE	TX	7.0930		870310
W5XO	PBBS	GAUSE	TX	14.1090		870310
W5XO	PBBS	GAUSE	TX	145.0100		870310
KA5ZEC-1	PBBS	LAS CRUCES	NM	145.0100		870120
WA5ZQS	PBBS	BRYAN	TX	145.0100		870102
WB6AIE	PBBS	FRESNO	CA	145.0300		861201
WB6AIE	PBBS	FRESNO	CA	145.0500		870111
WB6AIE-1	DIGIPEATER	BALD MT.	CA	145.0500		870111
W6AK-1	DIGIPEATER	MT. VACA	CA	145.0500		870111
W6AMT	DIGIPEATER	CRYSTAL PEAK	CA	145.0100		870120
W6AMT	DIGIPEATER	CRYSTAL PEAK	CA	223.5800		870201
W6AMT-1	DIGIPEATER	WILLIAMS HILL	CA	145.0100		870120
W6AMT-2	DIGIPEATER	SANTA YNEZ	CA	145.0100		870120
W6AMT-3	DIGIPEATER	PALOS VERDES	CA	145.0100		870120
W6AMT-4	DIGIPEATER	SAN MIGUEL MT.	CA	145.0100		870120
W6AMT-7	DIGIPEATER	ST. JOHN MT.	CA	145.0100		870120
K6ATQ-1	DIGIPEATER	SAN MARCOS	CA	145.0500		861201
N6ATQ-1	DIGIPEATER	SAN MARCOS	CA	145.0500		870111
WD6BFC	PBBS	REDDING	CA	145.0100		870120
WD6BFN	PBBS	BURBANK	CA	145.0100		861201
N6BGW-9	PBBS	CARSON	CA	145.0100		861201
N6BGW-9	PBBS	CARSON	CA	145.0500		861201
N6BGW-9	PBBS	CARSON	CA	145.0900		861201
N6BGW-9	PBBS	CARSON	CA	146.7450		861201
N6BMO-1	DIGIPEATER	SIERRA PEAK	CA	145.0100		870120
KE6BX	PBBS	HOLLISTER	CA	145.0100		870120
KE6BX	PBBS	HOLLISTER	CA	145.0900		870120
W6BXN	DIGIPEATER	TURLOCK	CA	145.0100		850416
W6BXN	DIGIPEATER	TURLOCK	CA	145.0300		861201
AI6C	DIGIPEATER	COLORADO SPRINGS	CO	145.0900		861018
KB6C-1	DIGIPEATER	FRAZIER MT.	CA	145.0500		870111
KB6C-4	DIGIPEATER	MT. OSO	CA	145.0500		870111
WB6CFO-1	PBBS	LIVERMORE	CA	145.0700		861201
WD6CMU-1	DIGIPEATER	BERKELEY	CA	145.0900		861201
N6CUS-1	PBBS	HACIENDA HEIGHTS	CA	145.0300		861201
N6CUS-1	PBBS	HACIENDA HEIGHTS	CA	146.7450		861201
W6CUS-1	PBBS	RICHMOND	CA	7.9300		861201
W6CUS-1	PBBS	RICHMOND	CA	14.1030		861201
W6CUS-1	PBBS	RICHMOND	CA	14.1070		861201
W6CUS-1	PBBS	RICHMOND	CA	145.0100		860204
W6CUS-1	PBBS	RICHMOND	CA	145.0300		861201
W6CUS-1	PBBS	RICHMOND	CA	145.0500		861201
W6CUS-1	PBBS	RICHMOND	CA	145.0900		861201
KA6DAC-1	DIGIPEATER	MONUMENT PARK	SD	145.0500		870111
WB6EGR-1	DIGIPEATER	MT. LEE	CA	145.0500		861201
WD6EJF-1	DIGIPEATER	MT. OSO	CA	145.0100		870120
KA6ENO-1	DIGIPEATER	KNEELAND	CA	145.0500		870120
WA6ERB	PBBS	LAKEWOOD	CO	14.1050		860204
WA6ERB	PBBS	LAKEWOOD	CO	145.0100		870120
WA6ERB	PBBS	LAKEWOOD	CO	145.0500		870120
KA6ERF	PBBS	NAPA	CA	145.0900		861201
KA6EYH-1	DIGIPEATER	SKYLINE	CA	145.0100		870120
AJ6F-1	PBBS	TORRANCE	CA	145.0700		870131
AJ6F-1	PBBS	TORRANCE	CA	145.3600		870131
W6FGC-2	DIGIPEATER	TWAINE HARTE	CA	145.0500		870111
WA6FSP-1	DIGIPEATER	PALO ALTO	CA	145.0300		861201
KD6GF-1	DIGIPEATER	MT. VACA	CA	145.0100		870120
N6GPP-1	DIGIPEATER	MT. BILL	CA	145.0100		870120
N6GPP-1	DIGIPEATER	MT. BILL	CA	146.1450		870120
W6GRR-1	DIGIPEATER	MCKITTRICK PEAK	CA	145.0100		870120

Call	Type	City	State	Frequency	Grid	Updated
W6GRR-1	DIGIPEATER	MCKITTRICK PEAK	CA	145.0300		870120
NW6H-1	DIGIPEATER	EL PASO MTS.	CA	145.0100		870120
N6HAV	PBBS	FRESNO	CA	145.0100		861201
WB6HHV-1	DIGIPEATER	SAN DIEGO	CA	145.0100		870120
AI6I-1	DIGIPEATER	HEMET	CA	145.0500		861201
N6IIU-1	PBBS	PALO ALTO	CA	145.0100		861201
N6IIU-1	DIGIPEATER	PALO ALTO	CA	145.0700		861201
N6JB-1	DIGIPEATER	ELK RIDGE	CA	145.0500		870120
N6JP-1	DIGIPEATER	ANGWIN	CA	145.0100		870120
N6JP-1	DIGIPEATER	ANGWIN	CA	145.0900		861201
KA6IQA	PBBS	TORREY PINES	CA	145.0100		870120
KA6IQA	PBBS	TORREY PINES	CA	145.0500		861201
KA6IQA-1	DIGIPEATER	TORREY PINES	CA	145.0100		870120
W6IXU	PBBS	ARROYO GRANDE	CA	145.0100		870120
W6IXU	PBBS	ARROYO GRANDE	CA	145.0500		861201
N6JFT-1	DIGIPEATER	LOMA LINDA	CA	145.0500		861201
N6JIX	DIGIPEATER	NORTH HOLLYWOOD	CA	145.0500		861201
WA6JOY	DIGIPEATER	SPRINGFIELD	VA	145.0700	FM18qf	870331
NK6K-1	PBBS	REDONDO BEACH	CA	145.0100		870131
NK6K-2	PBBS	REDONDO BEACH	CA	145.3600		870131
WB6KAJ	PBBS	BREA	CA	14.1090		870301
WB6KAJ	PBBS	BREA	CA	145.0100		861130
WB6KAJ-1	PBBS	BREA	CA	145.3600		870301
WB6KAJ-2	DIGIPEATER	SIERRA PEAK	CA	145.3600		861201
WB6KAJ-2	DIGIPEATER	SIERRA PEAK	CA	145.3600		870131
WB6KQY	PBBS	POMONA	CA	145.0100		870131
WB6KQY	PBBS	POMONA	CA	145.3600		870131
WB6LPZ-1	DIGIPEATER	SAN JOSE	CA	145.0300		861201
KE6LT	PBBS	BOULDER	CO	145.0100		870120
N6LUC-1	PBBS	CAMARILLO	CA	145.0300		870131
N6LUC-1	PBBS	CAMARILLO	CA	145.3600		870131
N6LYF-1	DIGIPEATER	SAN LUIS OBISPO	CA	145.0500		870111
N6MPW-1	DIGIPEATER	BEN LOMOND	CA	145.0900		861201
N6MVS	PBBS	SAN BERNARDINO	CA	145.0500		861201
KA6NEO-1	DIGIPEATER	KNEELAND	CA	145.0500		870120
WA6NWE	PBBS	NORTH HIGHLANDS	CA	145.0500		861201
W6NWG	DIGIPEATER	MT. PALOMAR	CA	145.0100		861201
W6NWG	DIGIPEATER	MT. PALOMAR	CA	145.0500		870111
W6OGC	DIGIPEATER	MT. OTAY, SAN DIEGO	CA	144.7600		870111
WA6OSA-1	DIGIPEATER	MT. STEPHENSON	CA	145.0100		870120
WA6OSA-2	PBBS	CLOVIS	CA	145.0100		870120
WA6OZJ	DIGIPEATER	VERDES	CA	145.0500		870111
W6PW-1	DIGIPEATER	SAN FRANCISCO	CA	145.0300		861201
W6PW-3	DIGIPEATER	SAN FRANCISCO	CA	223.5800		870201
K6QIF	DIGIPEATER	SACRAMENTO	CA	145.0100		850416
WB6QKP-1	PBBS	NUEVO	CA	145.0500		861201
KB6QL	DIGIPEATER	NORTHGLEEN	CO	145.0500		861018
K6RD	PBBS	LOS ANGELES	CA	145.0300		861201
WB6RIW-1	DIGIPEATER	BIG BEAR LAKE	CA	145.3600		870131
WB6RQN	DIGIPEATER	GERMANTOWN	MD	145.0500		861021
WA6RWN	DIGIPEATER	VISALIA	CA	145.0100		850416
W6SE	DIGIPEATER	SAN DIEGO	CA	145.3600		870131
W6SG-1	DIGIPEATER	SAN RAFAEL	CA	145.0500		861201
KA6SOX-1	DIGIPEATER	WESTMINSTER	CA	145.0100		850416
KD6SQ	PBBS	RANCHO CUCAMONGA	CA	14.1070		870131
KD6SQ	PBBS	RANCHO CUCAMONGA	CA	145.0100		860204
KD6SQ	PBBS	RANCHO CUCAMONGA	CA	145.0500		861201
KD6SQ	PBBS	RANCHO CUCAMONGA	CA	145.3600		870131
KD6TH	DIGIPEATER	WYCOFF	NJ	145.0100		861015
KD6TH	DIGIPEATER	WYCOFF	NJ	145.0500		861015

Call	Type	City	State	Frequency	Grid	Updated
KD6TH	DIGIPEATER	WYCOFF	NJ	221.0100		861015
KD6TH-1	PBBS	WYCOFF	NJ	145.0100		870310
KD6TH-1	PBBS	WYCOFF	NJ	145.0700		860803
WA6TLW-1	DIGIPEATER	SLIDE MT.	CA	145.0100		870120
AA6TN-1	DIGIPEATER	BIG BEAR MT.	CA	145.0100		870120
K6TZ-2	DIGIPEATER	SANTA BARBARA	CA	145.0500		870111
KA6UJF	DIGIPEATER	SAN JOSE	CA	145.0500		870111
WA6VSE	DIGIPEATER	FULLERTON	CA	145.0100		870120
WA6YBT	DIGIPEATER		PA	145.0500		870201
K6YGX-1	DIGIPEATER	NORTHRIDGE	CA	145.0300		861201
WA6YLB	DIGIPEATER	TULARE	CA	145.0500		870111
WB6YMH-2	PBBS	PALOS VERDES	CA	145.0100		861201
WB6YMH-2	PBBS	PALOS VERDES	CA	145.0300		861201
WB6YMH-2	PBBS	PALOS VERDES	CA	145.0500		861201
WB6YMH-2	PBBS	PALOS VERDES	CA	145.0900		861201
WB6YMH-2	PBBS	PALOS VERDES	CA	145.3600		870301
WA6YNG-1	DIGIPEATER	SHASTA BALLY	CA	145.0500		870111
WA6YXV-1	DIGIPEATER	MT. TAMALPAIS	CA	145.0100		870120
NV6Z	PBBS	SAN JOSE	CA	145.0700		861201
WD6Z-1	DIGIPEATER	CUESTA PEAK	CA	145.0100		870120
W6ZFN-1	DIGIPEATER	COALINGA	CA	145.0100		870120
W6ZFN-1	DIGIPEATER	FRESNO	CA	145.0300		861201
W6ZFN-2	DIGIPEATER	PALMDALE	CA	145.0100		870120
WA6ZSN-1	DIGIPEATER	VENTURA	CA	145.0300		861201
KB7AG	DIGIPEATER	KINGMAN	AZ	145.0100		870120
WN7ANK-5	DIGIPEATER	MUD MT.	WA	145.0100		870120
KE7AU	PBBS	OREM	UT	145.0300		870111
WB7AWO-1	DIGIPEATER	HORNBROOK	CA	145.0100		870120
KF7B	DIGIPEATER	PHOENIX	AZ	145.0100		860101
WB7BEG	PBBS	PROVO	UT	145.0300		870111
N7BI-4	DIGIPEATER	MICA PEAK	WA	145.0100		870120
WB7BNI	PBBS	UNION MT.	AZ	145.0100		870120
WB7BNI-1	DIGIPEATER	UNION MT.	AZ	145.0100		870120
WB7BNI-1	DIGIPEATER	UNION MT.	AZ	145.1100		870120
WB7BPI-1	DIGIPEATER	KING MOUNTAIN	OR	145.0100		870120
K7BUC	PBBS	PHOENIX	AZ	14.1030		861130
N7CEU	DIGIPEATER	WEST VALLEY	UT	145.0100		870111
KE7CZ	PBBS	DEWEY	AZ	7.0930		870120
KE7CZ	PBBS	DEWEY	AZ	14.1050		860204
KE7CZ	PBBS	DEWEY	AZ	145.0100		870120
KE7CZ-1	PBBS	MINGUS MT.	AZ	145.0100		870120
WB7DCH	PBBS	ENUMCLAW	WA	14.1090	CN97	870103
WB7DCH	PBBS	ENUMCLAW	WA	145.0100	CN97	870120
N7DME	DIGIPEATER	TUCSON	AZ	145.0100		860101
N7DME-1	PBBS	TUCSON	AZ	145.0100		860101
KA7DXJ	PBBS	CHEYENNE	WY	145.0100		870120
NY7E	DIGIPEATER	KEARNS	UT	145.0300		870111
K7EA-1	DIGIPEATER	PIX PEAK	UT	145.0100		870120
K7ENE-1	DIGIPEATER	IDAHO FALLS	ID	145.0100		870120
N7EQC-1	DIGIPEATER	SHERIDAN	WY	145.0100		861119
N7EVB-1	DIGIPEATER	JACKFLAT RIDGE	CA	145.0100		870120
KD7GL	DIGIPEATER	GLENDALE	AZ	145.0100		860101
W7GNP-1	DIGIPEATER	GREENS PEAK	AZ	145.0100		870120
N7GRN-1	DIGIPEATER	BELLEVUE	WA	145.0100		870120
WA7GTU	DIGIPEATER	CEDAR CITY	UT	145.0100		870120
WA7GTU-1	DIGIPEATER	IRON MT.	UT	145.0100		870120
WA7GTU-2	DIGIPEATER	FRISCO PEAK	UT	145.0100		870120
WA7HDI	DIGIPEATER	OAK HARBOR	WA	145.0100		870120
N7HQK	PBBS	CEDAR CITY	UT	145.0100		870120
K7IFG	DIGIPEATER	MT. LIVINGSTON	CO	145.0100		870120

Call	Type	City	State	Frequency	Grid	Updated
K7IFG	PBBS	PORTLAND	OR	145.0100		861130
WA7IJU-1	PBBS	CHEYENNE	WY	145.0100		861130
WA7JOF	DIGIPEATER	WEST VALLEY	UT	145.0100		870111
W7KMF-1	DIGIPEATER	DUBOIS	WY	145.0100		861119
KB7KY	DIGIPEATER	TEMPE	AZ	145.0100		860101
K7MBJ-1	DIGIPEATER	CODY	WY	145.0100		861119
WA7MBL	PBBS	LOGAN	UT	145.0100		870120
K7MM-5	DIGIPEATER	RIVERTON	WY	145.0100		861119
WA7MXZ-1	DIGIPEATER	MT. PISGAH	UT	145.0100		870120
WA7MXZ-2	PBBS	LOGAN	UT	145.0100		870111
KE7OM	PBBS	NORTH BEND	WA	145.0100		861130
KD7OT	DIGIPEATER	SANDY	UT	145.0100		870111
KD7PK	PBBS	LAS VEGAS	NV	145.0100		861130
K7PYK	PBBS	SCOTTSDALE	AZ	14.1090		870103
K7PYK	PBBS	SCOTTSDALE	AZ	145.0100		861130
WB7QKK	DIGIPEATER	GILBERT	AZ	145.0100		860101
WB7QKP-1	PBBS	NUEVO	CA	145.0500		861201
WB7QKP-2	DIGIPEATER	NUEVO	CA	145.0500		861201
WB7QWG	PBBS	WESTFIELD	IN	145.0100		860204
WB7RFS	DIGIPEATER	OREM	UT	145.0100		870111
K7RJ	DIGIPEATER	WEST VALLEY	UT	145.0100		870301
KA7RMA-1	PBBS	BOISE	ID	145.0100		870120
WB7RND	DIGIPEATER	SALT LAKE	UT	145.0100		870111
W7SC	DIGIPEATER	BOISE	ID	145.0100		870120
KA7SHX-1	DIGIPEATER	KEMMERER	WY	145.0100		861119
WB7SOW	DIGIPEATER	WEST JORDAN	UT	145.0900		870111
WA7SSO	PBBS	STATE COLLEGE	PA	145.0100		870324
WA7SVN	DIGIPEATER	OREM	UT	145.0100		870111
WB7SZM-1	DIGIPEATER	ROXY ANNE	OR	145.0100		870120
WB7TGF-1	DIGIPEATER	OLYMPIA	WA	145.0100		870120
WA7TJU-1	PBBS	CHEYENNE	WY	145.0100		861119
WB7TPY	DIGIPEATER	SCOTTSDALE	AZ	145.0100		860101
WB7TRX	PBBS	SALT LAKE CITY	UT	145.0100		870111
WB7TSY	DIGIPEATER	LEHI	UT	145.0100		870111
KB7TV	PBBS	BOYNTON BEACH	FL	145.0100		870301
WA7UHW-1	DIGIPEATER	MT. HARRISON	ID	145.0100		870120
WA7UZO	PBBS	SALT LAKE CITY	UT	145.0100		870120
KA7VEE	PBBS	EVERETT	WA	145.0100		861130
W7VEW-1	DIGIPEATER	LANDER	WY	145.0100		861119
WA7WAB-1	DIGIPEATER	BLUE MOUNTAIN	CO	145.0100		870120
K7WS-1	DIGIPEATER	MT. POTOSI	NV	145.0100		870120
K7WS-2	DIGIPEATER	ANGEL PEAK	NV	145.0100		870120
K7WS-3	DIGIPEATER	GOLDFIELD	NV	145.0100		870120
K7WS-4	DIGIPEATER	CHRISTMAS TREE	NV	145.0100		870120
WB7WTS-1	DIGIPEATER	CAVE MT.	NV	145.0100		870120
W7XI	PBBS	PORTLAND	OR	145.0100		870120
W7XI-1	DIGIPEATER	MT. LIVINGSTON	OR	145.0100		870120
N7XS-1	DIGIPEATER	POCATELLO	ID	145.0100		870120
KS7Y-1	PBBS	PRAIRIE PEAK	OR	145.0100		870120
WA7YAZ	DIGIPEATER	SALT LAKE CITY	UT	145.0100		870120
KD7YG-1	DIGIPEATER	FORBES RIDGE	UT	145.0100		870120
KD7YK-1	DIGIPEATER	OREM	UT	145.0100		870120
KD7YK-2	DIGIPEATER	SNOWBIRD PEAK	UT	145.0100		870120
W7ZAC-1	DIGIPEATER	CASPER	WY	145.0100		861119
K7ZVV-1	DIGIPEATER	LONGVIEW	WA	145.0100		870120
WA7ZWO	DIGIPEATER	KINGMAN	AZ	145.0100		870120
AI8A-2	DIGIPEATER	LOS GATOS	CA	145.0700		861201
W8AC	DIGIPEATER	CHARDON	OH	145.0100		851112
N8ACV	PBBS	DAYTON	OH	145.0100		861130
N8AGS-1	PBBS	SPRING LAKE	MI	145.0100		850926

Call	Type	City	State	Frequency	Grid	Updated
WB8BGY	DIGIPEATER	ALBION	MI	145.0100		851112
N8BMA	PBBS	DETROIT	MI	145.0100		861130
N8BMA	PBBS	DETROIT	MI	221.0100		860204
KJ8C	PBBS	HOLLAND	MI	145.0100		861130
KU8C	DIGIPEATER	FAIRMONT	WV	145.0100		861101
KB8CI	PBBS	CLEVELAND	OH	14.1070		860204
KB8CI	PBBS	CLEVELAND	OH	145.0100		870301
WB8CNN-1	DIGIPEATER	BECKLEY	WV	145.0100		861101
WB8CQR	DIGIPEATER	CLEVELAND	OH	145.0100		851112
WD8DHS	DIGIPEATER	BATTLE CREEK	MI	145.0100		851112
WA8EJH	DIGIPEATER	BLOOMINGTON	IN	145.0100		850926
WA8EJH-2	PBBS	BLOOMINGTON	IN	145.0100		850926
W8ELE	DIGIPEATER	GALLOWAY	OH	145.0100		851112
N8EMR	DIGIPEATER	COLUMBUS	OH	145.0100		851112
N8ERI	DIGIPEATER	MT. GILEAD	OH	145.0100		851112
WA8ERQ	PBBS	BLANCHESTER	OH	145.0100		861130
N8ET	PBBS	FINDLAY	OH	145.0100		870301
KA8EUU-1	DIGIPEATER	HUNTINGTON	WV	145.0100		861101
N8FIS	PBBS	FREMONT	OH	145.0100		861130
N8FJB	PBBS	BAKERTON	WV	145.0100		870301
N8FJB	PBBS	BAKERTON	WV	145.0500		851225
WB8FQJ-1	DIGIPEATER	BLAIR MTN, LOGAN	WV	145.0100		861101
N8FSY	DIGIPEATER	ST. CLAIRSVILLE	OH	145.0100		851112
W8GRG	PBBS	SHAKER HTS.	OH	145.0500		870301
N8GVG	DIGIPEATER	MONROE	MI	145.0100		851112
WA8HGL	PBBS	FAYETTEVILLE	NC	145.0100		870301
AD8I	PBBS	CIRCLEVILLE	OH	14.1090		861130
AD8I	PBBS	CIRCLEVILLE	OH	145.0100		870301
AD8J-1	DIGIPEATER	PITTSBURGH	PA	145.0100		870111
KC8JN	PBBS	WINTERSVILLE	OH	145.0100		870301
W8KOX-1	DIGIPEATER	DETROIT	MI	145.0100		851112
WB8LEA	DIGIPEATER	YOUNGSTOWN	OH	145.0100		851112
K8LG	DIGIPEATER	MORGANTOWN	WV	145.0100		851112
WB8LVP	PBBS	POLAND	OH	14.1030		860204
WB8LVP	PBBS	POLAND	OH	145.0100		861130
WB8LYF	DIGIPEATER	KENTON	OH	145.0100		851112
K8MMO	PBBS	OAKTON	VA	14.1090		870331
K8MMO	PBBS	OAKTON	VA	145.0700		870331
KB8NH	PBBS	FORT WAYNE	IN	145.0100		861130
W8OG	DIGIPEATER	DAYTON	OH	145.0100		851112
WB8OUE	DIGIPEATER	PHOENIX	AZ	145.0100		860101
WB8QBN	DIGIPEATER	CLEVELAND	OH	145.0100		851112
K8SLI-1	DIGIPEATER	ST ALBANS	WV	145.0100		861101
K8SRB	DIGIPEATER	KENTON	OH	145.0100		851112
KC8TW	PBBS	CINCINNATI	OH	145.0100		870120
KC8U	DIGIPEATER	COLUMBUS	OH	145.0100		851112
WA8URE	PBBS	GRAND RAPIDS	MI	145.0100		861130
WA8USO-1	DIGIPEATER	RAVENSWOOD	WV	145.0100		861101
WD8UU	DIGIPEATER	YOUNGSTOWN	OH	145.0100		851112
WB8WGA	PBBS	GAHANNA	OH	14.1050		851112
WB8WGA	PBBS	GAHANNA	OH	145.0100		851112
B8WKA	PBBS	SOUTHFIELD	MI	145.0100		860204
AD8Y	PBBS	ANN ARBOR	MI	145.0100		860204
K8YTE	DIGIPEATER	RALEIGH	NC	145.0100		861101
WA8YVR	PBBS	BLOOMINGTON	IN	145.0100		870324
KA8YYW-1	DIGIPEATER	WILLIAMSON	WV	145.0100		861101
WA8ZIA-1	PBBS	BOULDER	CO	145.0100		870120
WB8ZKI	DIGIPEATER	OUTVILLE	OH	145.0100		851112
KC8ZQ	PBBS	COLUMBUS	OH	145.0100		861130
KD8ZR-1	DIGIPEATER	TERRA ALTO	WV	145.0100		861101

Call	Type	City	State	Frequency	Grid	Updated
WB8ZTV	DIGIPEATER	MOUNDSVILLE	WV	145.0100		861112
WA9ABB	DIGIPEATER	COLORADO SPRINGS	CO	145.0100		861018
KA9AKM	DIGIPEATER	EDWARDSVILLE	IL	145.0100		850926
WB9ANQ	PBBS	ENON	OH	145.0100		861130
N9ATM-2	DIGIPEATER	CHICAGO	IL	144.9500		850926
K9AWX	PBBS	CHICAGO	IL	145.0100		861130
W9AZ	DIGIPEATER	KANKAKEE	IL	145.0100		870324
N9BAC	PBBS	FORT WAYNE	IN	145.0100		861130
N9CAI-1	DIGIPEATER	DAVENPORT	IA	145.0100		870324
KA9CAP	DIGIPEATER	URBANA	IL	145.0100		870103
KD9CC-1	DIGIPEATER	VALPARAISO	IN	145.0700		870324
N9CLE-1	DIGIPEATER	TOMAHAWK	WI	145.0100		850926
WB9CNE	PBBS	INDIANAPOLIS	IN	145.0100		861130
K9CW-1	DIGIPEATER	URBANA	IL	145.0100		870324
K9CYW-1	DIGIPEATER	GRIDLEY	IL	147.5550		870317
K9CYW-2	DIGIPEATER	GRIDLEY	IL	147.0100		870317
NI9D	PBBS	BROOKFIELD	WI	14.1070		860204
NI9D	PBBS	BROOKFIELD	WI	145.0100		850204
KM9D-1	PBBS	WEST LAFAYETTE	IN	145.0100		870324
N9DAN	DIGIPEATER	GREENVILLE	IL	145.0100		850926
WD9DHI	PBBS	CEDERBERG	WI	14.1090		870103
WD9DHI	PBBS	CEDERBERG	WI	145.0100		861130
KB9DU	DIGIPEATER	FILLMORE	IL	145.0100		850926
WB9EEA-1	DIGIPEATER	DUNDEE	IL	145.0100		851112
WD9EYB-1	PBBS	WEST TERRE HAUTE	IN	145.0100		850926
WA9FIO	DIGIPEATER	LACROSSE	WI	145.0100		870324
WA9GKA	DIGIPEATER	OTIS	IN	145.0100		850926
K9HHO	PBBS	GOODFIELD	IL	145.0100		870324
K9HHO	PBBS	GOODFIELD	IL	147.5550		870324
N9IF	DIGIPEATER	MADISON	WI	145.0100		850926
WA9INM-1	DIGIPEATER	PLYMOUTH	WI	145.0100		870324
K9JA	PBBS	URBANA	IL	145.0100		870324
KB9JD	PBBS	TERRE HAUTE	IN	145.0100		870324
KA9JQX-1	DIGIPEATER	ROCKFORD	IL	145.0100		850926
K9JRI	PBBS	INDIANAPOLIS	IN	145.0100		860204
KA9JXQ-1	DIGIPEATER	ANDERSON	IN	145.0100		850926
WA9KEC	PBBS	NORTH PRAIRIE	WI	145.0100		870324
WA9KEC	PBBS	NORTH PRAIRIE	WI	145.0900		870324
W9KXQ	DIGIPEATER	GREENVILLE	IL	145.0100		850926
KJ9L	PBBS	SKOKIE	IL	145.0100		870324
W9LCK-1	DIGIPEATER	ELGIN	IL	145.0900		870324
KD9LP-1	PBBS	PERU	IN	145.0100		861130
K9LSB-1	DIGIPEATER	FORT WAYNE	IN	145.0100		850926
W9LZQ-1	PBBS	LACROSSE	WI	145.0100		870324
KA9MFN	PBBS	GALESBURG	IL	145.0100		850926
WB9MJN	PBBS	NAPERVILLE	IL	145.0100		861130
WB9OWN	PBBS	NORTH PRAIRIE	WI	14.1070		870324
WB9OWN	PBBS	NORTH PRAIRIE	WI	145.0100		870324
KD9PU	PBBS	ELSMERE	KY	145.0100		870301
KA9Q	PBBS	WARREN	NJ	145.0100		850630
WB9QPG-1	DIGIPEATER	GREENHIL	IN	147.5550		850926
WB9RNW-2	DIGIPEATER	THOUSAND OAKS	CA	145.0900		861201
WB9RNW-3	DIGIPEATER	MT. WILSON	CA	145.0900		861201
WB9SDA	DIGIPEATER	FOND DU LAC	WI	145.0100		850926
WA9SOU-2	DIGIPEATER	NORTH FREEDOM	WI	145.0100		851112
WB9TYT-9	DIGIPEATER	SLINGER	WI	145.0900		870324
WA9UGO-1	DIGIPEATER	MARTINSVILLE	IL	145.0100		870324
WA9UKK	DIGIPEATER	WEST TERRE HAUTE	IN	145.0100		850926
WA9UXP	PBBS	VALPARAISO	IN	145.0100		870324
WA9UXP	PBBS	VALPARAISO	IN	145.0700		870324
AG9V	PBBS	GREEN BAY	WI	145.0100		870324
WB9WBN	DIGIPEATER	CHICAGO	IL	144.9500		870324
W9WI-1	PBBS	MADISON	WI	145.0100		870324
WA9WQS	PBBS	ANDERSON	IN	145.0100		861130
WB9WRW	DIGIPEATER	HUBERTUS	WI	145.0100		870324
WB9YLR	DIGIPEATER	LINDENHURST	IL	145.0100		851112
W9ZBD	PBBS	RHINELANDER	WI	145.0100		870324
W9ZGS	DIGIPEATER	DUNDEE	IL	145.0300		870324
W9ZRX	PBBS	WESTFIELD	IN	14.1090		870103
W9ZRX	PBBS	WESTFIELD	IN	145.0100		870310

nications. These should work very well with the IBM and compatibles and will probably allow you to run 1200 baud. Lines 1000-1020 is the routine to send responses out the RS-232 port.

The TERMINAL portion of this program, lines 10000-11040, are for convenience and can be removed. I used almost the same routine found in the back of the TNC manual. As you can see, the extra lines in this portion of the program are used to program the TNC and get back up to the Robot mode, etc.

SCROLL protection is done in line 1510, with a POKE 2964,4 and removed in line 4090, with a POKE 2964,0 when exiting the program. This is used only for the Model-IV user running TRSDOS 6.2 or TRSDOS 6.3 (LSDOS 6.3). If you are using TRSDOS 6.1, POKE 3013. If you choose not to use the PRINT AT statements then, don't use scroll protection.

I tried this program running under Model-III mode in my Model IV. It runs at the fast speed under LDOS, but misses letters when slowed down to regular Model-III speed. Maybe you can come up with a little faster routine on your Model III.

"If you have enough data statements and natural responses, you may even fool the other operator into thinking that he is talking to some human on the other end."

I have included the OUT statements in line 150 for this computer. Remove the REM from 150 and delete line 160. You will also have to change variables with more than two letters to two-letter variables.

If you have a cassette model, you could put the data files into data statements and eliminate the disk files. Even the CALLSIGN & NAME file could be put into data statements.

Finis

In the future, you might want to change the program to take messages or to leave messages for a friend from whom you are expecting a call, or maybe to work contest. As I don't work contest, I don't know if this would be legal or not, so it would be best to check the contest rules of the contest you are planning to enter. This program could be adapted to use on RTTY or CW with some modification. It could even be used on a telephone modem by checking modem status for a connect.

I hope you have as much fun using this program as I have had writing it. If you ever connect to KE5L you may be talking to TRON instead of me. 73's. ■

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MIRAGE /KLM

COMMUNICATIONS EQUIPMENT, INC.

KT-34XA TRIBANDER

BROADBAND EXCELLENCE THAT TAKES THE POWER

KLM's KT-34XA TRIBANDER is the 2nd generation of a unique new series of antennas designed to provide superior **broadband** coverage on 20, 15, and 10 meters. The combination of lossless linear loading and hi-Q air capacitors enables the KT-34XA to outperform **all** commercial available tribanders and meet or exceed the performance of a conventional stacked monoband system. The lower weight and windload of a single antenna mean reduced tower and rotator requirements. Thus, overall system costs can be kept to a minimum while enjoying the best of monobander-type performance.

KLM's field proven KT-34A is the heart of the "XA" model. The boom length of the "XA", however, has been doubled, and one tri-resonant and one full size 10 meter element have been added. These changes increase the gain to **11-11.3 dBd** on 10M, **9-9.5 dBd** on 15M, and **8.5-9 dBd** on 20M. Two driven elements are used to make the KT-34XA unusually broadbanded (a concept applied to many KLM antennas). Gain is virtually flat across each band except for 10 meters which has been optimized for the DX'er, 28-29 MHz. The chart shows the remarkable performance qualities of the KT-34XA.

The KT-34XA's design represents the first major advancement in tribander technology in over 20 years! The conventional traps, coils, and capacitors have been discarded in favor of integral linear loading and hi-Q air capacitors, all composed of aluminum tubing. These give the KT-34XA a conservative power handling capability of 4 KW PEP and an unusually high level of operating **efficiency**. Linear loading also makes full ¼-wave elements possible on 15 and 10 meters, and brings 20 meters much closer to the desirable ½-wave than any conventional tribander.

BANDWIDTHS:	14.0-14.350 MHz 21.0-21.50 MHz 28-29 MHz	**GAIN:**	8.5-9dB 9-9.5dB 11-11.3dB
VSWR:	1.5:1	**BOOM LENGTH:**	32 ft. x 3"O.D.
FB/FS:	20dB/40dB	**TURN RADIUS:**	21.5 ft.
FEED IMP.:	50 ohms w/balun	**WINDLOAD:**	9 sq. ft.
BALUN:	3-60-4:1 5KW PEP	**WT. (LBS.):**	75 lbs.
ELEMENT LENGTH:	24 ft.	**MAST:**	2" O.D. (standard)

Mechanically, the KT-34XA has been built to survive the toughest weather conditions. All aluminum, including the boom, is strong 6063-T832 alloy. All electrical hardware is stainless steel. Virtually indestructible "Lexan" insulators, just like those on KLM's 40 meter "Big Sticker," are used for mounting the elements and insulating them from the boom. KLM's 3-60 MHz 4:1 balun is supplied for direct connection to any 50 ohm feedline.

Turn your KT-34A into an XA.
Call your local dealer for price.
W. Lo Scott

MIRAGE /KLM

COMMUNICATIONS EQUIPMENT, INC.

P.O. Box 1000 • Morgan Hill, CA 95037
(408) 779-7363

CIRCLE 91 ON READER SERVICE CARD

W. C. Cloninger, Jr. K3OF
4409 Buckthorn Ct.
Rockville MD 20853

EZ PCBs

Printed circuit boards from a photocopier . . . well, almost!

Positive resists, negative resists, developers, sprays . . . you can forget about those and make your own printed circuit boards (PCBs) with a minimum of skill, effort, and cost. Thanks to a relatively new product—TEC-200™ film—there is no reason to wait any longer to make your own PCBs.

I am a fairly avid project builder and have hard-wired perfboards for many of my projects. I had resisted making my own PCBs because the methods I had read about seemed to require more time and effort than I wished to invest, or seemed a little too complicated. I noticed an ad for TEC-200 film, requested, and promptly received information from the supplier (The Meadowlake Corp., 25 Blanchard Dr., PO Box 497, Northport NY 11768) about the product. The process sounded so simple and appealing that I ordered 10 sheets of the film.

"I had resisted making my own PCBs because the methods I had read about seemed to require more time and effort than I wished to invest."

Photo A. A minimum of materials are needed to fabricate your own printed circuit boards. At the lower left is a completely filled sheet of TEC-200 film ready for transfer to copperclad board.

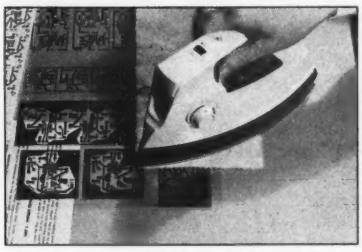

Photo B. An iron set for cotton (265°F to 295°F) is used to transfer the circuit design from the TEC-200 film to the copperclad board.

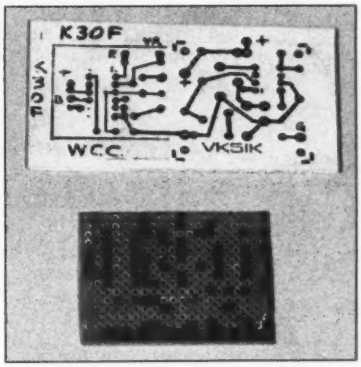

Photo C. Etched PC board with perfboard drilling template in the foreground.

The Process

Everything you need, except the copier, is shown in Photo A. The basic process is:

1. Photocopy the circuit pattern onto the TEC-200 film. (The film is placed in the paper tray of the photocopier.)
2. Transfer the circuit pattern from the TEC-200 to a copperclad board using an electric iron.
3. Etch the board, using any common etchant.
4. Cut and drill to finish the printed circuit board.

The Printed Circuit

Most magazine project articles include a full-size circuit pattern, but this can't always be counted on. However, you may make your own circuit patterns. There are special drafting products such as DATAK™ dry transfers to make your design look professional. I started, however, by drawing the circuit design on graph paper (.1" squares) using a felt-tipped pen and exercising care to complete all lines and make no unwanted overlaps. I photocopied the design to regular paper using a photocopier that is "blind" to the process blue of the graph paper. I then "cut and pasted" to fill up a full sheet of paper with desired circuit patterns. I quite often want more than just one PCB of the same circuit.

Execution

You will probably need a mirror image of the circuit patterns for the actual etching pattern. To obtain this mirror image, first photocopy the design to a sheet of TEC-200 film. Turn over this copy and back it with a clean piece of paper, and photocopy this onto another sheet of the film. This second copy is the one you will transfer directly to the cop-

Photo D. Don't drill your finger! Place PC board with template on a suitable surface before drilling. The small drill bits are easy to break, so take your time.

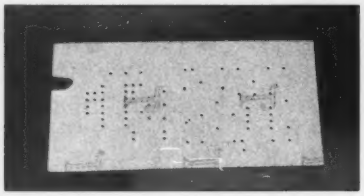

Photo E. Top of drilled PC board showing accurate hole pattern when using perfboard template.

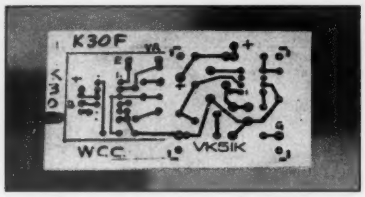

Photo F. Finished, ready-to-use PC board.

perclad board. The intermediate copy may be saved and reused by removing the toner with an organic solvent such as acetone, lacquer thinner, or Trichloroethane (Energine or Ford Spot Remover).

Next, transfer the circuit pattern to the copperclad board (Photo B). I used a piece of cloth between the iron and the TEC-200 film. I found that it requires about one minute to make a complete transfer pattern. I never experienced any problem with too much pressure or too much time for the transfer, but I *did* experience difficulty with too little of either. I used a resist pen to touch up any questionable parts of the pattern.

The board is now etched using any common etchant. I used ferric chloride, available from Radio Shack. The etchant instructions indicated a time of 15–20 minutes, but I found that my boards require about an hour of continuous agitation for complete removal of all unwanted copper. My next project. . . a motorized agitator! Keeping the etchant warm also hastens the process.

Completion

After washing and drying, the PCB is ready for completion. Drilling the holes in the PCB need not be a difficult task. I marked a perfboard (Photo C) for use as a drilling template. Although you cannot tell from the black-and-white photograph, there are actually two template patterns marked on the same perfboard. They are simply marked in two different colors. The template is carefully positioned and clamped to the etched board. I used a .043″ (#57 wire guage) PC drill bit with a 1/8″ shank in a rotary tool and the template made accurate drilling a breeze (Photo D). You can buy reconditioned PC drill bits from Jameco Electronics (1355 Shoreway Road, Belmont CA 94002) and carbide bits from Hal-tronix, Inc., (12671 Dix Toledo Highway, PO Box 1101, Southgate MI 48195). The top side of the PCB (Photo E) shows the uniform, properly aligned holes for easy installation of DIP sockets and other components. You may want to tin-plate the PCB using a chemical dip. A tinning kit—TINNIT™—can be obtained from the DATAK Corporation (65–71st Street, Guttenberg NJ 07093).

The PCB is now ready for component installation. The actual circuit shown (Photo F) is a "crowbar" circuit from a magazine article, married to a voltage regulator drawn as described above.

No more perfboard projects for me! ■

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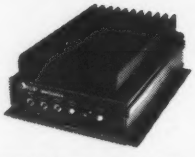

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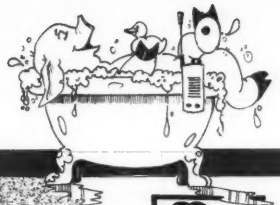

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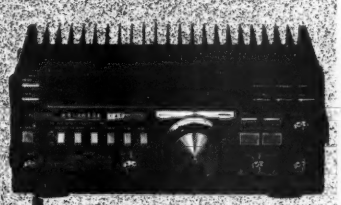

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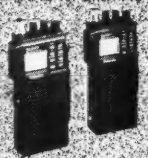

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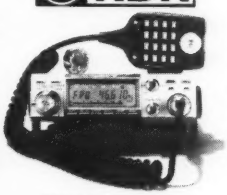

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IC-2AT Packet Interface

Use WB5WSV's external PTT circuit to get on packet with an IC-2AT and an MFJ-1270.

I have been using the MFJ-1270 TAPR TNC-2 clone for about three months and have been very pleased with the unit's performance. I connected the MFJ-1270 to my Atari 520ST and old ICOM IC-215 and experienced no interfacing problems; I didn't even have to mess with my TNC's output levels. However, I was more eager to use my more modern, synthesized ICOM IC-2AT in order to expand the frequencies on which I could work packet. This effort became an imperative when the 145.01 transmit crystal in the IC-215 died.

Trying to interface the IC-2AT to the MFJ-1270 presented a problem. The TNC has a typical transceiver-type PTT connection which grounds the PTT line to transmit. The IC-2AT has no separate PTT line for the external mike; it performs T/R switching by sensing the impedance change when the mike is switched on, as shown in Fig. 1.

Experimentation showed that the IC-2AT would not key up when connected directly to the TNC, even when a data signal was present. I also found that the IC-2AT needed about 30k or less of resistance across the mike input to key up.

The solution to the problem was the circuit shown in Fig. 2. The PTT signal from the TNC causes the relay, K1, to close, and the potentiometer, R1, is set at a value low enough to cause the transceiver to key up. Some experimentation will be needed to find the proper setting of R1. Too low a setting will short out the output of the TNC; too high a setting will prevent the transmitter from keying up reliably. For my rig, I found that 30k worked best. The speaker is optional, but I've found that it helps to be able to monitor signals audibly.

The circuit is about as simple as they get. Use a relay which has a relatively low coil current requirement so as not to make extreme demands on the power MOSFET in the TNC. The relay I use, a Radio Shack 275-227, pulls about 60 mA. I cannot recommend magnetic-reed relays (such as the Radio Shack 275-233) because they are too sensitive to rf. In fact, RFI proved to be quite a problem in any case. With an antenna plugged directly into the IC-2AT connector, transmitting caused the system to lock up after the PTT signal was removed. This was corrected by using an rf-tight box, placing ferrite beads on the audio and power lines, and operating on the transmitter low-power setting. If your system still locks up, I suggest mounting the antenna some distance from the rig.

After you've got the interface box built and hooked up, set the TNC transmit delay (TXDELAY) to a value that will give transceiver time to key up. I found a TXDELAY value of 50—equal to 50 ms—worked fine. Then find a setting of R1 which will suffice; start out with about 10k and adjust. Finally, set the output level of the TNC to that required to give a good modulation level, using the instructions in the MFJ manual. ■

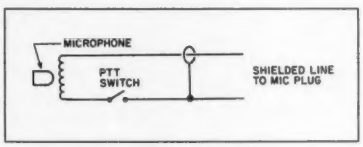

Fig. 1. IC-2AT switching.

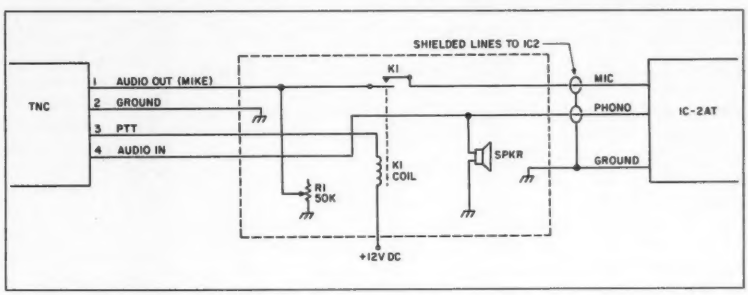

Fig. 2. Interface circuit.

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GETTING OLD

I passed my 31st birthday the other day, which is undeniably over 30. The music I grew up with is now only played on "classic rock" stations, just one step removed from "golden oldies". I saw an interview with the new crew of "Star Trek, the Next Generation", a bunch of geeks not fit to pilot Captain Kirk's shuttle craft. I recently gave a packet talk to some high school kids who hadn't been born when I got my first ham ticket. My life is over.

Still, it could be worse. I was at a dinner party the other night where I was subjected to a lot of hooey by some senior types about how "kids today" (meaning me) didn't know what it was like to have to work for a living. I heard interminable stories about how they used to earn $100 a week and had to do more than watch a computer do the work for them.

Since these were people my wife works with, I avoided pointing out that back when they were making $100 a week, they could buy twice the house and 5 times the land outright for the 20 percent down payment on my 1270-square-foot house and 50 X 100 foot lot. I didn't mention the 5 1/4 percent mortgage they got, or that my regular American car cost 5 times what theirs did and will last half as long. Or that they used up all the cheap gas. They paid 20 cents a gallon—my first gallon was 60 cents. Grumble.

Anyway, I'm going to do my bit to address the generation gap issue. I'm not worrying about anyone over 31, by the way—I didn't trust anyone over 30 when I was under 30 and I see no reason to start now. Roy Neal K6DUE, and a camera crew are coming over tomorrow to shoot some "World of Amateur Radio"-style packet scenes for a documentary on amateur radio. Not that I was their first choice, mind you. It seems that some old guy stood them up. I'm going to stick pictures of Wayne (you know, the ones with the bulls' eyes) over most of the equipment I've accumulated over the years and try to show just the minimum needed to enter the amateur hobby from the digital side. I haven't seen too many new novices bouncing through the packet network yet; hopefully, this is just due to a lack of gateways with inputs in the new novice portion of the bands. See what your club can do to support a novice access port. One day one of those kids is going to make a starting salary several times what your current salary is—maybe he'll buy a keg for Field Day 1997.

I know the transition to the next section is weak, but I'm cleaning for the camera crew tomorrow. To top things off, the Letterman show is a rerun, and I've lost the will to live. You'll just have to take this transition cold turkey.

"To top things off, the Letterman show is a rerun, and I've lost the will to live."

HF STA

Speaking of old things, the request to the FCC for a Special Temporary Authorization (STA) to run a 24-hour, fully-automated, and unattended packet on HF has finally been submitted. This has been "in committee" for more than a year, as various groups inside and outside the ARRL argued over the scope, duration, and number of participants.

An amateur radio STA is something you ask for when you want to do an experiment that is within the basic definition of amateur radio but outside the letter of the current law. Several of the specialized modes in use on the amateur bands now saw their first use by a few hams running under an STA. Sometimes new amateur bands are warmed up by an expeditionary force doing propagation experiments under an STA. The new WARC bands (10 MHz, 18 MHz, and 24 MHz) had such an STA. The usual goal of an STA group is to report the results of the experi-

"The American Radio Relay League (the nonprofit, educational and scientific organization representing the interests of more than 400,000 licensed radio amateurs in the U.S.) respectfully requests that the Commission grant special temporary authority to permit experimentation, as detailed below. This application is made on behalf of, and with the consent of, the individuals named herein (see column).These individuals volunteered to be part of this STA, which was prepared without reference to whether or not these individuals are League members.

1. Names and Addresses of the Applicants. The names and addresses of the applicants are given in the attached letters of participation.

2. Description of Special Need. Temporary authority is required to permit unattended automatic operation of amateur stations using packet radio below 50 MHz. Specific waiver of section 97.80 of the Commission's rules is needed to permit unattended operation under automatic control while transmitting third-party traffic on frequencies below 50 MHz.

3. Type of Operations. Operations will involve packet-switched transfer of messages between unattended amateur stations operating under automatic control on HF.

a. Purpose: The amateur stations participating in the STA will function as relay stations in a long-haul HF net called SKIPNET which connects at the end points with the existing and rapidly growing VHF amateur packet-radio network. The VHF packet network is presently capable of only local and regional message forwarding up to about 150 miles reliably and up to about 300 miles at the extreme. SKIPNET will provide the long-distance links needed to effect an amateur packet-radio message-transfer capability throughout the United States, thus significantly enhancing the amateurs' emergency-communications capabilities.

b. Objectives: The objectives of this request for STA are:

(1) to prove the concept of unattended automatic control of HF packet-radio stations;

(2) to demonstrate experimentally that such operation can be conducted without: (a) harmful interference to other users; (b) malfunction of transmitters such that they deny others the use of the operating frequency; and, (c) transmission of improper communications without timely corrective action.

(3) to determine the design and responsible management of a nationwide network of stations conducting such operations.

(4) to gather information necessary for drafting of a petition for a permanent rule change to permit unattended automatic control of HF packet-radio stations.

4. Dates and Times of Operation. The applicants request that operation under the STA commence immediately upon the granting of authority by the Commission, and that such authority be permitted for six months. The operations are to be on a 24-hour basis during the STA period.

5. Class of Stations and Radio Service. All stations are licensed in the amateur service, and all hold a minimum of a General class license.

6. Location. Locations of the stations are given in the individual letters of participation, attached.

7. Number of Transmitters. No waiver of amateur rules is required.

8. Operating Frequencies. The operating frequencies are listed below. These listed frequencies designate the center frequencies of the channels. It is our intention that the frequencies listed will be used, but we wish to retain the flexibility of changing a few kHz in order to avoid interference. One or more of these frequencies will be in use at any one time, according to diurnal propagational needs: 3607.3, 7091.3, 10147.3(•), and 14108.3 kHz (•Band edge of 10150 kHz to be respected at all times).

9. Output Power of Transmitters. The transmitter output power shall not exceed 200 watts.

10. Type of Emission. J2D and F1D emissions are to be used.

11. Description of Antenna. A variety of antennas will be used. No special waiver of the rules is requested."

ment to the FCC, and then petition for a rules change that would make whatever they were doing under the STA part of Part 97 and legal for any amateur.

Such is the case with the current STA. Its purpose is to run an experiment and gather data on unattended, automated HF packet operation. Hopefully, the final report will show that such operation is a benefit to the amateur community and the general public in times of emergency, that it does not cause undue hardship on current users of the band, and that it does not damage the ionosphere. With hard facts in hand, we will be in a stronger position to petition the FCC to permit regular automated unattended operation on HF as a regular part of the amateur regs. The STA will also provide a focus on related issues. For example, the sort of operation the STA will allow is something that has not been popular in some corners in the past, i.e., a net that is always in session. The packet style of channel-sharing is starting to occur, but the sharing now is only with other packet users. As practice has shown over the past several years, channel-sharing between voice-users and data-users seldom works to anyone's advantage, even if the packet station is attended. Where a packet net differs from older types of "perpetual nets" is that liter- ally thousands of hams are be- ing served by the HF-packet network. This service should more than make up for the removal of "the packet frequency(ies)" from the pool of old-style QSO frequencies.

The purpose of the STA is not to show that no one will be displaced, or that an automated HF network fits in the current international bandplans. As with anything new, the old must be juggled around a bit to make room.

Part of the purpose of the proposed STA is to document the number of messages and the number of to/from address pairs serviced by the STA network. The STA should generate usable results, since most of the participants come from the ranks of the current "14.109" network (see the January 87 column).

The text of the STA requested by the ARRL is reproduced in the sidebar, minus some legal boilerplate.

```
Uplinked by GB2UP
FTO:W0RLI @ NK6K ! W0RLI FDE:G8UFQ @ GB3UP ! G8UFQ
Msg#  MMDD   UTC   T Size  TO    @       BBS FROM     TITLE
1328  0614   0632  781     DCE   GB3UP   G8UFQ

Time.H For W0RLI "C" source (Help!!)
R:870614 0430  @ G1AWD G8UFQ #1587 (Reading IO91LI [TVPRG BBS]
R:870614/0304  @ G4MTP #1457 (DAVENTRY BBS)
R:870614 0222  @ G1DIL #2265 (Wolverhampton) [Maxpak BBS]
R:870614 0140  @ GB3CD #1659 (Cheshire IO83TF)
R:870613 1143  @ G4CLI #333 (Wakefield) [IO93FP]
R:870613 1131  @ G8UFQ #237 (Grimsby) [IO93XN]
W0RLI @ W0RLI

Hi. You should have received a letter explaining my interest in your "C" source for the BBS code. Could you please tell me where I can get hold of the TIME.H file that you use when compiling. I am most interested in playing with the code as I am a newcomer to "C" and it is an ideal opportunity to try and learn it. Many thanks. Graham G8UFQ @ G8UFQ via GB3UP
```

Fig 1. Message from G8UFQ to W0RLI via the UO11 DCE.

UO11 DCE

A quickie to finish up this month: the UO11 DCE is now seeing regular use as a mail gateway between the UK, the US, and Australia. GB2UP at the University of Surrey is the satellite uplink in the UK, and GB3UP is the local BBS. VK5AGR is the gateway in Australia; NK6K and K1KSY are handling the task in the U.S. Figure 1 shows one of the first messages to come through via GB2UP for forwarding via NK6K.

See you next month.■

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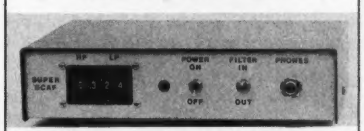

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WHERE IS PHASE 3 C?

Even though satellite activity has been on the upswing since AMSAT-OSCAR-10's return to the air, we can't help wondering about A-O-10's replacement. While still exciting, A-O-10 is not the satellite it once was.

There is a lack of telemetry on the general beacon frequency, and the attitude of the spacecraft is obviously uncontrollable.

So when will Phase 3 C graduate to OSCAR status?

It's been over a year since Phase 3 C, accompanied by three trunks of parts, tools and gear, was delivered to Continental Air Cargo at Denver's Stapleton Airport for its journey to Houston and Frankfurt, Germany. After 12 months of construction and testing by the Colorado team of AMSAT satellite builders, the nearly completed spaceframe was sent to the group at AMSAT-DL (Germany) to be finished.

Today Phase 3 C awaits word on the much-delayed launch schedule of the European Space Agency. It is still in West Germany undergoing some final upgrades, including the new, radiation-hardened memory circuits donated by the Harris Corporation. The addition of these new memory ICs should allow the satellite to survive the rigors of space radiation far better than its predecessor, A-O-10.

Once a launch date is set for Ariane mission V-21, Phase 3 C will be readied for lift-off.

When will this happen? AMSAT anticipates an early 1988 launch, although all could be ready if a launch came as soon as this autumn.

The many delays in the European Space Agency launch schedule have been blamed on problems with the HM7-B third-stage engine built by SEP of France.

In May of last year, the V-18 mission was lost due to an ignition malfunction in the third-stage engine. Earlier this year, after the engine ignitors were redesigned, the HM7-B for the V-19 mission was damaged in the SEP vacuum chamber testing facility.

Now the engine from the V-20 mission, brought in to replace the damaged V-19 motor, is having problems with the turbopump bearing system. Hundreds of millions of dollars worth of satellites are waiting for their turn to fly. Phase 3 C will be one of four payloads on the first Ariane 4 vehicle. We all hope for a successful lift-off soon.

What can Phase 3 C do that A-O-10 cannot? (Note the preliminary frequency plan for Phase 3 C in Figure 1.) A-O-10 was primarily a Mode B satellite (70 cm up and 2 m down). Phase 3 C offers three prominent improvements in addition to the standard Mode-B transponder and functional Mode-L system (23 cm up and 70 cm down).

The first new item seen in the figure is Mode JL. This will allow simultaneous J (2 m up and 70 cm down) and L activity. Note that the Mode-J transponder is a subset of the Mode-L downlink. The Mode L transponder is 250-kHz wide with a 40-kHz wide Mode J within it. This will allow those with 1.2- GHz equipment (Novices?) to communicate with hams using 2 m for their uplink, assuming both have the necessary 435-MHz rigs for reception.

Another important addition found on Phase 3 C is the Mode- S transponder with a 70-cm uplink and a 13-cm downlink. At first, the 2.4-GHz downlink may seem rather foreboding, but i would be surprised if simple construction articles and kits don't show up soon. Four-foot homemade dishes with single-board receive converters should become quite common.

Many innovative hams and experimenters have been building 2.1-GHz TV converters for years. The article, "You Can Watch Those Secret TV Channels" by K0JB and K0FQA in the August 1979 issue of *73*, demonstrates one of the earlier, yet functional, home-brew projects dealing with microwave receive converters.

The Mode-S transponder is quite narrow (20 to 30 kHz), but should be capable of supporting at least four SSB QSOs with no problem. During final tests around June 1986, the measured power output was 1.25 Watts. This was for nearly 700 continuous hours.

Phase 3C

Estimated Launch Date: Early 1988
(PRELIMINARY ESTIMATES)
As of April 1987

Summary: Mode B: 70 cm up; 2 meters down Mode JL: 24 cm and 2 meters up; 70 cm down Mode S: 70 cm up; 13 cm down RUDAK: 24 cm up; 70 cm down Beacons: Mode B: General Beacon 145.8125; Engineering Beacon 145.975 Mode JL: General Beacon 435.650; Engineering Beacon 435.675 Mode S: 2400.640

Mode B:	Uplink (MHz)	Downlink (MHz)	
		145.975	Engineering Beacon
	435.425	145.975	Passband limit, upper
	435.435	145.965	
	435.445	145.955	
	435.455	145.945	
	435.465	145.935	
	435.475	145.925	
	435.485	145.915	
	435.495	145.905	
	435.505	145.895	Passband center
	435.515	145.885	
	435.525	145.875	
	435.535	145.865	
	435.545	145.855	
	435.555	145.845	
	435.565	145.835	
	435.575	145.825	Passband limit, lower
		145.8125	General Beacon

Mode JL: L Uplink	J1 Uplink	Downlink	J2 Uplink	
1269.325		435.975		L Passband limit, upper
1269.330	145.820	435.970	144.440	J Sub-band limit, upper
1269.340	145.830	435.960	144.450	
1269.350	145.840	435.950	144.460	J Sub-band center
1269.360	145.850	435.940	144.470	
1269.370	145.860	435.930	144.480	J Sub-band limit, lower
1269.380		435.920		
1269.390		435.910		
1269.400		435.900		
1269.410		435.890		
1269.420		435.880		
1269.430		435.870		
1269.440		435.860		
1269.450		435.850		L Passband Center
1269.460		435.840		
1269.470		435.830		
1269.480		435.820		
1269.490		435.810		
1269.500		435.800		
1269.510		435.790		
1269.520		435.780		
1269.530		435.770		
1269.540		435.760		
1269.550		435.750		
1269.560		435.740		
1269.570		435.730		
1269.575		435.725		L Passband limit, lower
		435.675		Engineering Beacon
		435.650		General Beacon

Mode S:	Uplink	Downlink	
		2400.640	Beacon
	435.610	2400.695	Passband limit, lower
	435.615	2400.700	
	435.620	2400.705	
	435.625	2400.710	Passband center
	435.630	2400.715	
	435.635	2400.720	
	435.640	2400.725	Passband limit, lower

RUDAK:	1269.675	435.675	Single channel

Source: AMSAT DL, DJ5KQ, DJ0HC/KE6MN, KØRZ

Fig. 1.

The overall transponder efficiency is about 17 percent. Mode S represents the highest frequency yet for a hamsat transponder.

The final item noted in Figure 1 is RUDAK. This stands for Regenerativer Umsetzer fur Digital Amateur Kommunikation, or Amateur Radio Digipeater. It will be AX.25

Continued on p. 60

NEVER SAY DIE

from page 10

make DX contacts in "his" CW band.

Then came sideband, which kind of snuck up on the old-timer AMers—starting on the high end of 20m, where only the lowest of low would even listen. Sideband started at one end of the band and swept down until it forced the AMers, kicking and screaming, off the low end.

By the mid-60s AM was about gone, with just a few hold-outs like W2OY doing their best to make life miserable for as many of us as possible.

It was a desire to go back to the good old days of the privileged ham—the old Class A ham—which brought on Incentive Licensing in 1963. The 3995 group of AM old-timers had moved to 3999 with their private club. FCC Commissioner Sterling (a ham) had made a mess of things as far as the old-timers were concerned with his damned Novice, Technician, General, and Extra crap. The ARRL proposal which blew our whole hobby to bits was essentially designed to undo George Sterling's changes and put things back the way they were before WWII.

We had a little excursion in the early 70s when FM and repeaters came along, but that didn't change the low bands—which are pretty much the way they were almost 30 years ago.

Lacking the youngsters to invent and pioneer new communications modes, I guess we'll be using sideband from now until we lose the rest of our bands to commercial interests. We've moved in about 20-year spurts in the past—spark 1900–1920, CW 1920–1940, AM 1940–1960, SSB 1960–? That's about it, eh?

Conversation

There are a few troublemakers who have been caviling about what they feel is the dreadful intellectual void on our bands. They've been bitching about our sticking to making our contacts boring beyond belief. I think it's time to speak up for the average ham and show up these intellectual snobs.

If you've done any hamming recently, you know as well as I that with few exceptions there's nothing even remotely approaching a clear channel. We're still stuck with our 1950s horribly antiquated sideband technology which assures us of QRM-packed contacts. When you're hearing only about 10% of what a chap is saying to you, you have to know what he's saying before he says it. Further, it's very helpful to be able to make a contact with nothing whatever heard beyond the call. . . and that's what we've got.

If the handle comes through, that's a plus—probably because the chap has spelled it out several times and you've managed to get a letter here and there, then pieced the parts together in what looks like a name (checked in the Callbook, *just in case). But without the name, "old man" is just fine.*

sort of sixth-sense which would alert me when the other chap would turn it back. These days I have my little computer in my lap to answer my mail and write editorials.

Have you ever tried to think of something interesting to say during a contact? Most ham minds come up with a total blank on that one, so they do like me and repeat the usual ritual—something that comes automatically and requires no thought whatever. Hey, we don't want to use up the mind, do we? Better to save it for some more important use.

Now and then I've suggested shortening our contacts so we might have less QRM. I wonder if a Contact Book—a book with the essential information from each active amateur which could be looked up after a contact has been consummated—might be a good project? Then all we'd have to get through would be the call letters. From there on we'd look up the contact in The Contact Book which would give us the name,

"Incentive Licensing, which blew our whole hobby to bits, was essentially designed to undo George Sterling's changes and put things back the way they were before WWII."

The main thing is to be able to sense when the other chap has stopped sending so you can come back. That's the tough part. Usually you can just make out his voice in the bedlam and go back, thanking him for the information on his rig, his antenna, his location and his weather and your report (put 5-9 in your log—you can't go wrong with that). Assure him that you're filling out his QSL now and thank him for offering to send his—give him his 5-9 report "with a little QRM" and turn it back.

This is our normal ham contact and it's ideally suited to our communications system. Beyond the call, nothing further has to really be communicated.

In case of one of those rare contacts where the other chap is banging in and swamping the others on the channel, instead of dozing off you can keep up a lively conversation with whoever is in the shack with you—or, better yet, read *73*. I used to get most of my construction projects built while making contacts. I developed a

town, rig, antenna, and perhaps even a paragraph of two of non-essential information. All reports would be, as now, 5-9. Yes, yes, I know—you're worried about the weather information. I have an answer for that, too. On the back cover of the book we'll have a weather spinner. When you look up the contact you spin it and find out whether he has rain, snow, cold, hot, or whatever.

But what, you ask, if the chap changes his antenna? Hey, we'll bring out a new, updated edition of the book every ten years, so where's the problem?

I remember a few years ago when I used to ask my contacts what they did. For the last few years everyone I've contacted has been retired, so we don't even have to put that in the book. Hamming is a great hobby for those with unlimited time to do nothing of any value whatever—almost as good as playing golf, which has been described as a way of needlessly extending useless lives.

Cheers.

HOW TO USE THE TELEPHONE

Almost everyone I see using the telephone in any kind of noisy environment tries to cope with the problem the same way: They stick their index finger in the other ear to block out the noise. This may be helpful in digging the wax out of the unused ear, but it's of no use in making it easier to hear. I guess they don't teach much about ears in school these days.

If you use the right technique, you'll be able to hear over the phone despite almost unbelievable background noise. You see, we have an incredible computer built into our head (big news flash!), one quite capable of separating the sounds from each ear, allowing you to put your attention on either, both, or none. This is called the cocktail party effect. Perhaps you've noticed, when you're in a room full of people, that even though there are a number of conversations going on around the room, you can selectively listen to any group you want.

The noise that's really bothering you when you're using the telephone isn't what's coming in the other ear, it's the noise being picked up by the telephone microphone and coming into the same ear you're trying to use to hear on the phone. Right, all you have to do is put your hand over the mike, not a finger in your ear. The brain will shut off the second ear for you with more efficiency than your finger—and the noise won't jam the incoming conversation.

Make sense? Now, go out and educate the world on how to use the telephone. It's a thankless job, but someone has to do it.

Vox Pop

Virtually every rig has a VOX circuit built in. Other than as a sales feature, I wonder why? I haven't heard anyone use a VOX in years. . . and thank heavens!

The voice on xmit (VOX) seemed like a good idea. How great to be able to talk with someone almost as we do when we meet them in person. Two people can't, even in person, talk at once, so presumably a VOX circuit should enable us to have contacts that are more like talking in person. Alas, it doesn't work in practice.

There are several problems with the system. First, let's say your VOX works fine and your rig can go on and off the air without relays snapping and popping. Even so, every time you pause for a breath or a thought, your receiv-

er comes back on. Now, if the frequency is completely silent, this might not be a major problem, but when was the last time you heard a silent frequency on the low bands? No, every time the receiver comes on, you're subjected to noise. . . a lot of noise.

We'll do a lot to avoid the noise—such as draw out our words while we try to think of what to say next. We'll errr and ahhh to keep the damned rig from turning off until the brain gets into gear again.

Not every rig goes into the transmit mode silently. Then, with a VOX, you have a relay or two snapping after every pause for breath. Drives you crazy. Well, it sure drives you away from VOX.

Then there's the problem of not knowing if the chap has turned it over to you or is just catching a breath, in which case you'll double for a while. . . and then stop using your VOX.

When there's much QRM, VOX is useless anyway. We can make contacts through pretty heavy interference because our contacts are all identical. If we hear even a shred of the word "nine," we know it's a signal report of five by nine, which is what you get no matter how weak or how unintelligible your signal is. When we hear the letters Q, S, or L, we know he's promised to send a card and wants one of ours. The only touchy parts of a contact are the call and the name—everything else is cookie-cutter. The name is either Bob or Bill, anyway, so please give me your call again.

That's why no one uses VOX. So now explain to me why we're still paying for this artifact that has never been of much value and isn't even used now. Perhaps we should mention it to the manufacturers.

Yes, I agree it's handy to have a rig designed so it can be used for fast break-in on CW. I'm not going to stir up anything by wondering what percentage of us actually get on CW—and, of that minority, how many use fast break-in.

Now, while I'm discussing vestigial circuits, I would like you to turn your damned voice processor down. About the only time a voice processor will help is when you're trying to drown out a bigger signal in a pileup and could care less about intelligibility. It's not likely you'll be understood, considering the distortion, but the circuit will increase your average voice power and tend to wipe out everyone else on the channel.

You know full well that the speech processor distorts your voice, right? So why on earth are you using the damned thing? Turn it off! If your signal is too weak to get through without it, buy an amplifier or put up a better antenna; don't crank up the processor and garbage up the frequency.

Some hams have a very serious problem—they want to put out every lousy Watt they can, so they turn up their mike gain and the compressor, with the result that every sigh, gasp, and stomach rumble modulates the rig 100%—as does every background noise in the shack—kids yelling and running around, the wife screaming at 'em. Give me a break.

Yes, I know there's a paranoid feeling that if the output meter doesn't stay up around 800 Watts no one will be able to hear you. I remember one time I was talking with a chap in Tokyo on 20m and my final dropped dead. I apprehensively called to see if I could get through with my driver and let him know what had happened. He came right back and said the drop in my signal wasn't really noticeable. I carried on the contact, feeling weak and vulnerable, expecting at any moment to lose him.

Tell you what, give me a hand (well, voice) asking chaps with their gain and compressors set too high to back off so we can hear what they actually sound like. This will also narrow their signal, allowing someone else to get a word in edgewise.

Just one of us won't get anywhere with this. It's going to take some wearing down of the more serious offenders. They'll be madder 'n hell with the first few of us to ask them to turn things down, but even the worst of lousy operating can eventually be corrected if we are polite, but firm. The hard part is in not getting mad right back when they attack you for having the gall to suggest they're screwing up. Use the *illegitimi carborundum* approach—wear the bastards down.

RADAR JAMMING

The battle between motorists and moving tax units—also known as radar-bearing police cars—continues to escalate. Since they're mostly using 10.5 GHz, which almost amounts to sharing our 10.0–10.5-GHz ham band, perhaps we should keep up with what's been happening.

It all started years ago with the first police radar units. It didn't take long before Regency came out with a detector. Alas, it wasn't sensitive enough to be of any real value—which made it worse than nothing because impressionable motorists would invest in it and then drive along at speed, believing they were safe from police attack.

Two chaps from Drake decided to make a 10.5-GHz receiver sensitive enough to actually do the job. It worked gangbusters, so they formed Cincinnati Microwave and started making the Escort. This revolutionized the field—and made millions for the ex-Drake techies.

The earlier receivers had just been tuned detectors—and this included the Fuzzbusters, which thus gave minimal warning. I tried most of these as they came out. At one time I had six of 'em mounted in my van. Some were better than others, but none were very good.

The Escort was the first superheterodyne receiver. Turn in your ham ticket if you can't explain the difference and diagram how a superhet works—and why it is so much better.

As Escorts and a growing number of knock-offs proliferated, it was inevitable that the police would counter these detectors. Efforts by states to outlaw the detectors were knocked down by the courts, so the radar makers came up with a hand gun system which gave no warning. Bad news for speeders, right? Well, before you get too smug, remember that surveys show that over 90% of the cars on many highways exceed the 55-mph limit.

This police escalation has resulted in a brisk market for jamming transmitters. Oregon Microwave claims they've sold over 40,000 so far. A jamming transmitter can be set to transmit an audio tone which will be read by the police radar as a speed—you set the speed.

I read an article in a car magazine saying they tested 'em and none of these jamming transmitters actually work. Jammers are, of course, illegal.

For those of you who, like me, don't like to dawdle while driving, there actually is a radar jamming device which not only works, but is legal. Let's say I'm driving a Porsche 911c, which is designed to be quite safe at 160 mph. I'm on a straight highway at 2 a.m. and there's not another car within miles. Do you really think I'm going to endanger myself by driving at 55 mph? I'd likely fall asleep from boredom. This is a major cause of accidents, by the way.

Now I suppose you're anxious for me to publish the relatively simple circuit for this effective, legal radar jammer. Well, I don't see why I should, since I already published it several years ago in *73*—complete construction plans.

The unit is brilliant in design—invented by a radar design engineer. Here's how it works. A radar transmitter sends out a pulse and then listens for it to be reflected from things. Reflections from stationary objects are ignored, with the receiver designed to hear the audio tones generated by moving objects—the Doppler shift, it's called.

Different cars reflect different amounts—so a big truck or van with a flat front which reflects the radar signals well can be picked up at a much greater distance than a small sleek sports car. Okay, suppose we mount a high-gain antenna which is tuned to the radar frequency on a car. This will reflect back one whale of a signal compared to that reflected just by the car itself. It'll thus be picked up further away and the strength of the reflected signal from this tuned antenna will mask anything bouncing back from the car itself as it gets closer.

The next step is to see that this walloping reflected signal reads a low speed on the radar unit. By mixing a low audio frequency with the reflected signal, the police radar will indicate the speed of your choice. And all this is done with no transmitter—just a very effective passive reflector. Well, mostly passive, except for perhaps a 25 mph audio tone with which you're modulating the returned signal.

This won't help against police planes. You need a sun roof to avoid these. Nor will it help against unmarked police cars or police cars that come up behind you and clock you.

If any readers have had success in radar jamming I'd like to hear from them. Until then, I suspect that hitting the radar frequency closely enough to jam may be difficult. That's what I like about a semi-passive reflector—it just does a better job of reflecting than your car, plus a slight massaging of the signal.

By the way, if you're a law and order fanatic, maybe you'll start pressuring Congress to kill the 55-mph limit. Figures lie and liars figure—so before you start believ-

ing government reports that the speed limit has saved lives, better check it out. *Car & Driver* blew that baloney to smithereens, showing the bottom line to be more lives lost with the 55 limit than without it.

Well, how about all the gas savings . . . right? That was the original justification for the 55 law. Baloney again. We'd save more gas if we increased our tire pressures by a couple pounds than we save by driving slowly. It's a political ploy, pure and simple—it's wasting a lot of time for millions of people, providing a most welcome income for towns from fines and a bonanza for insurance firms in increased premiums.

The 55 limit may not bother you if you poke along in a rusty old Chevy, which is dangerous at anything over 40. But it irks me when I'm driving a high-performance car on clear roads. I've taken the trouble to train myself to handle cars on race tracks—to handle them in rain, ice, snow, mud, and so on. I've driven over 50,000 miles of car rallies under every imaginable road condition. It doesn't make a lot of sense to me to have to drive at 40 mph on a road just because some drivers are using cars that aren't safe beyond that—or haven't ever bothered to develop good driving skills.

Speed doesn't kill—lousy cars and lousy drivers kill. Even more often, drunk drivers kill. Sadly it's still macho to drink too much and to brag about it. So our kids, striving to be grown up, drink and get killed. The families grieve for their loss, but never give a thought to the role model they provided which led their kid to drink—and killed 'em. Every kid I've known who got killed while driving drunk had drinking parents.

My parents and grandparents smoked and drank. I was fortunate perhaps in not heeding social pressures as much as my peers. This might have been due to my interest in electronics and hamming, which gave me an ego outlet so I didn't have to try to look older—to be cool—by smoking and drinking.

Sure, I tried smoking—ugh, it was awful. I tried beer . . . ugh again. The peer pressures in the Navy were enough to get me drinking—had a great time out in San Francisco, but I used trolly cars and jitneys, so no accidents—other than a busted foot when I stumbled one night. That got me 40 years of government disability payments—almost worth it maybe. What happened was the broken bone wasn't set right, so my foot was weak from then on.

After I got out of the Navy I pretty much stopped drinking—perhaps a cocktail a couple times a year—but not if I'm driving.

This radar/jamming war will end when we have a fair system of speed limits. Hint: The European system of having no speed limits on many roads seems to produce fewer accidents.

We're into a philosophical wilderness when the government makes laws aimed at protecting us from ourselves. The recent case of a woman who took drugs which killed her newborn child being indicted for the child's death leads us into a potential for suits against mothers who smoke, drink, etc., during pregnancy and thus deprive their children of intelligence.

This overprotectiveness seems to fail when real money is involved. We know tobacco kills and maims, but we do little about it. We know alcohol kills and maims, but we still encourage it. Heck, alcohol is a major profit center for New Hampshire—which has its own liquor stores all over the state.

Am I suggesting prohibition again? No more than I'm in favor of the 55-mile limit. Many think pregnant mothers should be allowed to smoke, drink, and take drugs, all of which we know have bad effects on their children—many of whom we then have to care for in special institutions. We call them "special" children. Every effort should be made to make sure people know what the results of their actions are going to be.

We have a similar problem with drugs. Every effort to stop their sale has failed. It's only by education that any real changes can be made. As long as kids think it's cool to drink beer, we're going to have dead kids and lots of business for ambulances, hospitals, and doctors. As long as they think it's cool to do drugs, we're going to have more dead kids. Smoking is the best of all—with long-term benefits for the tobacco industry and the health care industry—plus the need for schools for brain-damaged children. Congress believes smoking is good for the economy—and obviously they're right.

So, let's say that every study showing the 55-mile limit is killing and maiming more than it saves is wrong—let's say that despite studies we decide that driving faster will cause more accidents instead of less. This would mean more business for the health care industry as well as the funeral business—a plus.

I like that new name for doctors—the health care industry. That's like when they changed the name of the War Department to the Department of Defense. How long before it's renamed again as the Peace Department? It's the sickness business and it'll stay that way until we have hospitals that keep people healthy.

How about you? Are you in favor of the government making more and more laws that force us to do what a political group thinks is right? Should it be illegal to smoke when pregnant? Should it be illegal to drink—even a little—and then drive?

One more thing—I don't want to hear that any of you have been sending jamming signals on 10.5 GHz with the explanation that, heck, you were just calling CQ on one of your ham bands.

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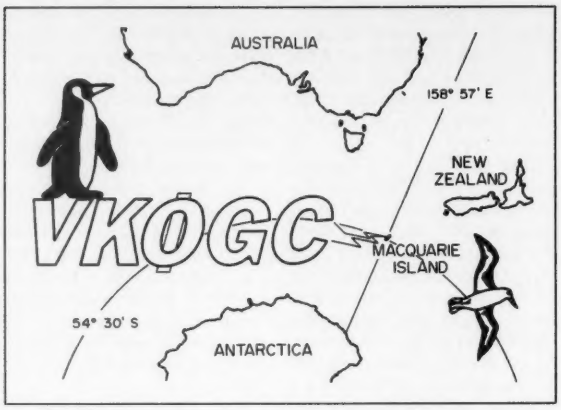

Graham's card clearly shows the location of remote Macquarie Island.

MACQUARIE ISLAND VKØ

Lonely Macquarie Island lies midway between New Zealand and the icy coast of Antarctica (see VKØGC's QSL card). A year-round crew of 22 researchers and staff inhabit the isolated island, with a handful of scientists joining them for a few months in the summer. They study cosmic rays, weather, and the upper atmosphere. Fortunately for DXers, at least one of the permanent staff has been a ham radio operator. Graham Currie VKØGC lived on the island for a year, and recently returned to Macquarie after an extended around-the-world tour. Graham has shared some of what life is like on this isolated Antarctic outpost with *73* readers.

Getting to Macquarie is trouble enough. With no icebreakers of its own, the Australian government that administers the island hires a suitable ship for about $20,000 a day. Each November (late spring in the Southern Hemisphere) the supply and crew rotation ship steams three days from Hobart, Australia, and drops anchor off the rocky coast. Helicopters and barges then begin ferrying men and equipment ashore. Again in February the ship returns with more supplies and to picks up the scientists who were there for the summer. For the next eight months the only contact Macquarie will have with the outside world is an occasional parachute drop from a C-130 and, of course, radio.

Weather on Macquarie varies from cool to miserable, with temperatures hovering just above freezing, frequent rain, and high winds. A fog bank shrouds the island 350 days a year.

Living conditions on the island are comfortable for such a remote location. An expanding library of videotapes, a "bar," and a pool table provide some recreation. Watching penguins and elephant seals is another popular pastime. More than 2000 giant elephant seals cluster around the living quarters. And some of the penguin rookeries on Macquarie hold more than 750,000 birds!

Ham Radio

The Macquarie Island ham shack sits more than 100 feet above the cluster of buildings that passes for "downtown" on the island. The long, winding trail up the hill leads to an excellent radio location, but please remember the hill when you ask for skeds. The shack is equipped with a Kenwood TS-120 and Collins 30S1 linear. One minor problems: Low-band operation interferes with the island's seismograph, registering little earthquakes in a CQ pattern!

"During the parachute drops, the entire population of the island stands downwind with their backs to the sea, hoping to stop mail and supplies from drifting into the ocean."

The antenna consists of six 450-foot-long wires arrayed across the north. (There's not much to work south of Macquarie!) Graham connects any pair of wires to a 600-Ohm balun and antenna tuner. Adjacent wires produce a narrow beam; other pairs produce a wider spread. Top-banders should note that the due-North pair seems to work especially well on 160 meters. The over-water leg of the antenna proved the most difficult to erect; hundreds of pounds of kelp dangled from the wire as they tried to raise it out of the ocean.

Why this unusual antenna? "Simple," says Graham. "It's the only antenna that can stay up all year in the face of 80-knot winds and salt spray."

Graham admits to some problems with his initial QSL procedure. Underestimating the demand for VKØ cards, Graham arranged a QSL mail drop with an Australian ham. However, this ham was not a true QSL manager, as Graham had no way to get the logs off Macquarie until the relief ship docked in November. (Parachute drops don't work in the up direction, and Graham's 100-word telegram limit couldn't cover his 6000+ contacts.) So the mail piled up until Graham returned to Australia at the end of his one-year tour of the island, a process that prompted many irate letters from impatient DXers. "The first thing I did when I returned to Australia was to spend the next two weeks, 8 hours a day, answering QSL cards," he remembers.

For his second tour last year, Graham arranged for the cards to be sent to him on Macquarie, via periodic parachute drop. During these drops, the entire population of the island stands downwind with their backs to the sea, hoping to stop mail and supplies from drifting into the ocean. While this plan would have eliminated abusive letters to the "manager," it would not have provided a speedy reply to the DXer; return mail would still have to wait for the spring relief ship.

Fortunately for the peace of mind of DXers who could imagine THEIR card landing in the drink, Graham got an offer he couldn't refuse from Jim Smith VK9NS. Freed of a word limit on his teletype, Graham now types his log into an error-correcting, computer-data link from Macquarie to Australia, where the log is printed out and mailed to Jim on Norfolk Island. The process takes less than 2 weeks, compared to as long as nine months without assistance.

Graham Currie VKØGC on his recent round-the-world tour, between year-long stints on Macquarie Island.

DXers looking for VKØ contacts should look for Graham VKØGC in the Brown Sugar Net, 14.309 at 0300Z on weekends. Graham also haunts 1.831/2 at 0900Z on Mondays. He moves to 3.795 if he doesn't get any takers on 160, but he'll return to 160 if asked. QSL via VK9NS. Sunrise 2200Z, sunset 0500Z.■

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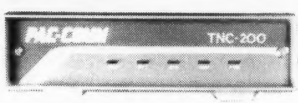

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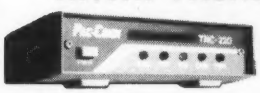

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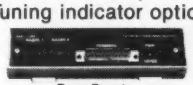

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ABOVE AND BEYOND

Peter H. Putman KT2B
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FEEDBACK

One of the fun things about writing this column is the reader feedback, especially on points of contention (whether technical or otherwise). Back in June, I made a proposal to redefine the ARRL Band Plan for 23 cm to enable Novice weak-signal operation in the segment from 1294–1295 MHz, shifting the narrowband FM simplex segment down 1 MHz to 1293.00 MHz. Boy, did I get some interesting mail on this idea!

Mike Stone WB0QCD, who authors the ATV column in *73*, wrote via a QSL card: "Your proposal did not consider ATV subcarriers that already occupy that part of the band (sound at 1293.75 with video at 1289.25). This was all hashed out 2 years ago through many months of meetings. You are grossly overestimating the number of interested Novices. Why not share 1294–1295? Please research all modes before making such statements."

Well, there I go again! Mike, I based this proposal on observed activity here on the East Coast, where the predominant mode is SSB/CW. I admit I didn't have all the data from other parts of the country—sometimes it takes a column like June to get that response. And perhaps I am overestimating the number of interested Novices! For further illumination, let's take a look at comments filed by Tom O'Hara W6ORG (owner of P.C. Electronics):

"It has been my observation that 23 cm is a puzzle to most hams, let alone Novices. We have had an ATV exciter out for about a year now that will work with any of the 2/23-cm transverters with little sales volume. At Dayton this year, I asked Spectrum International, The PX Shack, and Transverters Unlimited to honestly tell me if they have had many sales or interest in 23-cm transverters, especially with Novice Enhancement. The answer was no."

Tom went on to say: "Gordon West [of Gordon West Radio Schools] found that those interested in VHF/UHF go straight to Technician class since it is only 25 more questions to take in addition to the Novice exam. When you compare the cost of 220 gear and band performance, the choice is obvious. Moreover, if one compares 2 meters to 220 or 23 cm, I can see why many say why not go ahead with the 25 more questions while I'm at it."

Tom was a member of the group that worked on the 23-cm band plan, especially with regard to ATV. He was in favor of releasing the entire band to Novices—as I was—and on his enclosed Southern California plan he notes that the upper 200 kHz of the 1294–1295-MHz segment has been reserved for Novice weak-signal work. This was not indicated on the ARRL plan, but I'm glad to see someone took it into consideration.

Both Mike and Tom raise the same point: Why not share 1294–1295 MHz? Indeed, considering the highly directional characteristics of 23-cm communications, with corresponding channel density, this makes sense. Perhaps that 200-kHz segment is all that will ever be needed for Novice weak-signal work—if Novices are capable of or even interested in this type of operation. Okay, guys—you've convinced me. The question is—can we get Novices up onto 23 cm to use that allocation? I'd like to hear from readers on this one.

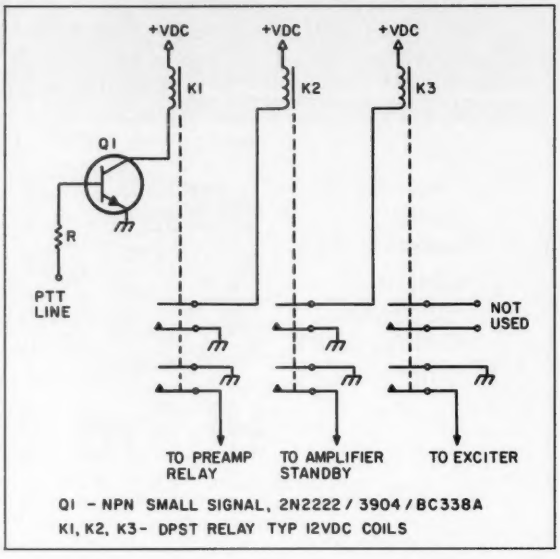

Fig. 1.

"I asked Spectrum International, The PX Shack, and Transverters Unlimited to honestly tell me if they have had much interest in 23-cm transverters."

Nuts and Bolts Dept.

With the increasing numbers of transceivers, preamplifiers, and transverters coming on the market using GaAsFETs, I felt it time to discuss the proper care of same.

First, the good news is that the prices of GaAsFETs have dropped dramatically over the past five years. For example, my favorite all-around device—the NEC 411 series—can be had for as little as $1.50 in small quantities. Blow it up—no problem. Just solder a new one in. The bad news is that it still doesn't take much effort to blow one out, and that's VERY bad news for those using mast-mounted preamplifiers.

Let's consider a few things that don't mix here: How about RF-VOX circuits and GaAsFETs? Specifically, solid-state amplifiers with rf-sensed keying (virtually any of the major brands on the market) which can create switching transients of enough power to obliterate the device in use. It's happened to me many times on 432 with a Mirage D1010N and an ARR 432VDG in a home-brew housing.

If you employ such amplifiers, either turn the drop-out delay to absolute minimum, or select the FM setting. This has no effect on the linearity of the amplifier—they run Class AB in SSB or CW—but disables the dropout delay system. Next, disable the RF-VOX on your transceiver or transverter by switching such a circuit out or desoldering detection diodes. Lastly, employ a system of hard-keying with external relays to switch into transmit and actuate any external relays.

Even with such a system, rf transients from medium- to high-power amplifiers still pose too much of a threat to the GaAsFET. Now is the time to think of sequencing the various active parts of your station, such as the exciter, amplifier, and preamplifier. By sequencing, I mean a system where the order in which the active stages key or unkey is always the same, allowing small delays between each stage to ensure solid key-up/down. Ideally, with a mast-mounted preamplifier and single feedline, you'd want to switch the preamp out of the line, then switch the amplifier to standby, and finally key the VHF/UHF exciter.

When going into receive, the process is reversed: The exciter drops out, the amplifier goes out of standby, and then the preamplifier is switched back inline. In theory, all of the rf present on the line has dissipated before the preamp is connected. If sequenced correctly, this should be and is the case. But you must ensure that the sequence is always the same, every time.

Some common schemes employ a series of relays connected in a sequence (see Fig. 1) so that the contacts of the first connect voltage to the coil of the second, the second to the third, and so on. This isn't a bad idea, and in the key-up mode the relays will fire in the correct order. But how do you get them to drop out in reverse order? Removing the voltage to the first relay drops all of the re-

lays at once, which may or may not result in an rf spike going up the transmission line.

A more sensible approach is to use a ramping system, similar to that used in the Advanced Receiver Research sequencers (see Fig. 2).[1] This design employs an LM3900 as an integrator, driving four sections of an LM319 (functioning as a quad comparator), which in turn actuates reed relays. The trick is that the output from the integrator is a linear voltage up and down ramp. By using the voltage dividers on the + inputs of each LM3900 section to set a threshold trigger value, they will change state and pull in the relays in a precise order. When the voltage drops (key-up), the fall of the voltage across the – inputs is also linear and each comparator reverts to its original state in reverse order—causing the relays to drop out accordingly.

It's not very complicated, but it works very well. I've used this particular sequencer with a medium-power (300-W) tube amplifier on 432 MHz, and had excellent service until one of the reed relays hung up. A suggestion: Use mercury-wetted relays (available as an option from ARR). They cost a bit more, but are far more dependable, especially if you are switching fairly high voltages such as tube bias. Dow-Key or similar antenna relays can also create quite a spike across the reed relay and short it out.

A suggestion: Protect your relays (and related devices) by installing diodes backwards across the dc coil. Use a hefty diode: 1N914s won't last long. I use 1N4004 or 1N4007 types here. A .1-uF disc across the coil is also a good idea, and between the two they should eliminate any high-voltage transients.

If you employ the ARR sequencer, you'll notice four sets of contacts: one normally closed (NC) and three normally open (NO). I prefer to obtain a second normally closed relay and physically cut the power to the preamp before switching the antenna relay. There is an opinion that this is unecessary—maybe so. I felt it gave me extra protection, and the GaAsFET's certainly lasted a long time, so who's to say it didn't make a difference?

Another suggestion: Configure your station so that your mast-mounted antenna relay pulls in on receive—not transmit. Why? In case you lose power to the sequencer, the preamplifier is taken out of the line. When not on the air, cutting power does the same thing and affords extra protection if severe thunderstorm activity is nearby. Finally, should you manage to blow out the preamplifier anyway, you can still remain on the air sans preamp by again cutting the power to the relays.

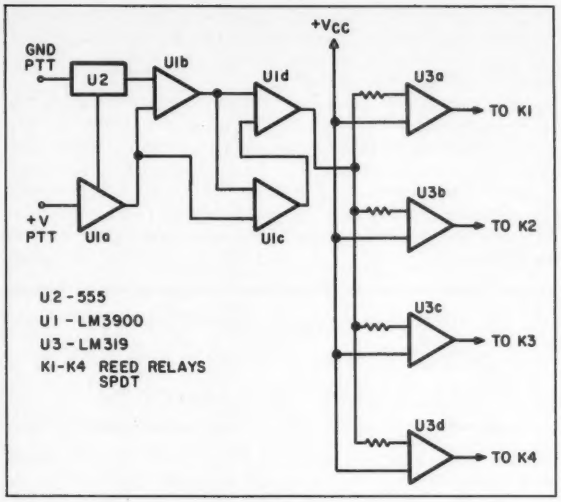

Fig. 2.

> ***"One of the most talked-about radios at Dayton had to be the new ICOM IC-900 . . ."***

And speaking of relays: Use good ones! Dow-Key types are expensive but worth it (in most cases). The little DK-77 series can be had at flea markets for about $10–$15 each and will handle 100–200 Watts up to 432 MHz. Derate above this frequency accordingly. The larger types will handle up to 500 W or more on 432, and the type G option affords nearly 100 dB of isolation between the receive and transmit ports. (This makes your kilowatt signal level look like 100 nanowatts at the input to the preamp.)

Dayton Update: Part II

One of the most talked-about radios at Dayton had to be the new ICOM IC-900, a unique multiband transceiver system using an ultra-thin control head, an interface/processor unit under the seat of your car, and a second rf head/interface in the trunk—lined by a fiber optic bundle. Adding a band is as simple as buying the module and attaching it to the rearward interface. The system allows duplex operation on any two bands from the control head, which is so small it can go almost anywhere.

The cost to get on one band is close to $800. Is it worth it? Could you go with a dual-bander on 2 and 432 for less money? Would four separate transceivers for 144, 220, 440, and 1260 be the cheaper way to go? How well does the darn thing work, anyway . . . or is this technology for technology's sake?

Good questions . . . and I hope to answer them in the next few months. This is a radical departure from any FM transceiver system I've ever seen, and the only multiband system that approached it in cost and sophistication was the late, lamented Drake UV-3 (for 144, 220, and 440). One thing's for certain—this will be the most unusual review I've ever undertaken. For one thing, I don't even have a trunk on my Honda Civic wagon (a minor detail).

Letters, Letters

I'm just starting to get through the backlog of mail received during our move to Pennsylvania. Ralph Marler K1YLO wrote in to tell of his renewed interest in VHF activity. Ralph plans to use a Hamtronics 144–148-MHz receive converter with a Cobra CB rig, and is thinking of employing a transmit converter as well. Ralph, most transmit converters require very little drive. It should be an easy matter to reduce the output of the Cobra to obtain the required drive—typically in the neighborhood of 10–300 milliwatts. As far as frequency conversion goes, it might be better to shift the LO frequency on the Cobra to obtain 28-MHz coverage instead of 27 MHz. I'm personally not familiar with the Cobra unit, but a glance at the schematic should reveal where to make the modification.

If the Cobra employs a crystalplexer, then a new selection of crystals and some minor bench alignment is all that's required. I have several friends who've done just that to various makes of CB radios, pulling them up to 28.500 MHz for 10-meter work. All it took was new crystals and a different local-oscillator frequency. After conversion, your Cobra should work just fine as an exciter for 2 meters as well as other VHF/UHF frequencies. Any readers have experience with this type of conversion?

Ralph also asks if using DSB on 2 is acceptable. Again, most stations are employing USB exclusively on 50 MHz and above . . . no DSB operation that I am aware of. All multimodes for 6, 2, 70 cm, etc., are equipped for SSB only (as well as CW, FM, and perhaps AM as well). In addition, those using low-band transceivers with transverters are also employing USB.

One inexpensive way to go is locate a secondhand Ten-Tec Argonaut, which lends itself very well to transverter work because its output is variable and under 5 Watts. It will provide USB/LSB/CW modes to boot, runs off dc with low current requirements, and is lightweight as well for portable work. You can probably find one at a flea market for under $200.

That's it for this month. Next month I'll have a report on our trip to Chincoteague Island for the June VHF Contest, as we attempted to give out grid square FM27 to the needy. In the near future I'll also be looking at the IC-12AT, and comparing the IC-03AT/FT-109RH 220-MHz hand-helds. Also, I plan to look at the Cushcraft 220B 220-MHz Boomer for weak-signal work.

Until then, see you Above and Beyond.■

Continued from p. 52

packet compatible, but as with FUJI-OSCAR-12, a modem will be required to communicate via the RUDAK experiment.

The uplink will be 2400 bits/s differential biphase PSK (phase shift keying) with a downlink using 400 bits/s PSK. If you ever listened to the PSK beacon on A-O-10 prior to its memory loss, this is how RUDAK will sound. More background on OSCAR-10's PSK can be found in James Miller's article "A PSK Telemetry Demodulator for OSCAR 10" in the April, 1985, issue of *Ham Radio Magazine*. The RUDAK system for Phase 3 C was conceived, designed and built by AMSAT DL.

Figure 2 shows the present configuration of A-O-10. In addition to Mode L, which is no longer operational, the engineering beacon has not been on, and the general beacon has been heard only as a steady carrier with no telemetry. A comparison of Figures 1 and 2 shows why amateur satellite enthusiasts are really excited about the potential of Phase 3 C.

FUJI-OSCAR-12

I have received many requests for a more detailed block diagram of my set-up for Mode JD (the digital transponder) on board FUJI-OSCAR-12 (Figure 3.) It may not be pretty, but it works! When I am operating via Mode JD, it seems like every electronic device in the shack is involved. This is a more complex system than most stations require, but with the exception of the G3RUH PSK modem, I didn't need any other new devices to complete my system. Keeping the cost down overcame any objections I may have had concerning complexity.

"Keeping the cost down overcame any objections I may have had concerning my complexity."

A few stations here in North America are very active on Mode JD. They are VE3JF, WB7QKK, KA9LNV and WA8EBM. Others have been on the air, but not as often. Most stations use home-brewed systems based on the TAPR design or have built systems using the G3RUH modem circuit board. The TAPR modem kit's entry on the scene in mid-June helped to increase activity.

Some JA (the analog transponder) operation has been reported, but much of the time, the satellite is recharging or in Mode JD. When the ground control stations complete their experiments for software uploading, we hope to have an operating schedule. In the meantime, monitor the nets and listen for JA or JD activity.

RS

Last month's prediction that the next Russian hamsat will be RS10 with RS9's name is holding firm. Sources in Europe have indicated that the "new" RS9 may even have three ROBOT autotransponders, one for each of the available modes, A (2 m up and 10 m down), T (15 m up and 2 m down), and K (15 m up and 10 m down). We are still anticipating a summer launch.

The older RS satellites, 5 and 7, have been hard to find. The battery problems haven't improved. However, assuming no further failures on board these veteran hamsats, we can expect excellent operating conditions in August and December when both satellites will be in continuous sunlight. The days prior to and just after these fully-illuminated periods will also yield good conditions for satellite chasers.

During the other months between now and the end of 1987, RS5 and RS7 will experience as much as 35 minutes of darkness during each two-hour orbit. October 15th will be one of the poorest days. It is unlikely that ground-control stations will bother to activate the satellites even for short periods when the eclipsing is at its worst.

Satellite Wave Listeners

The SWL, or Short Wave Listener, is everywhere. If you have made many international HF contacts, you have probablyreceived a few SWL cards. Nobody told these folks that they had to stick to terrestrial QSOs. They monitor the satellites too—all of them, and all modes. Who would guess that a CW QSO between Pearland, Texas and Parkville, Missouri via A-O-10 would be heard in Czechoslovakia on a home-brew receiver using a four-element Yagi?

When 10 meters is open, RS downlink signals may be heard when the satellite is many thousands of miles out of range for uplink on 2 meters.

If you receive a card from a listener, be sure to reply. These present-day observers may become tomorrow's participants and contributors. On the other hand, if you are not yet ready to transmit, or lack the required license level for a particular satellite mode of interest, try listening. It's good practice, and you may be surprised at what you hear!■

AMSAT OSCAR 10

Summary: Mode B: 70 cm up; 2 meters down Mode L: 24 cm up; 70 cm down Beacons: Mode B: General Beacon 145.810 MHz; Engineering Beacon 145.987 MHz Mode L: (No longer operational)

Mode B:	Uplink (MHz)	Downlink (MHz)	
		145.987	Engineering Beacon
	435.030	145.975	Passband limit, upper
	435.045	145.960	General use limit, upper
	435.050	145.955	
	435.060	145.945	
	435.070	145.935	
	435.080	145.925	
	435.090	145.915	
	435.100	145.905	
	435.105	145.900	Nominal passband center
	435.110	145.895	
	435.120	145.885	
	435.130	145.875	
	435.140	145.865	
	435.150	145.855	
	435.160	145.845	General use limit, lower
	435.180	145.825	Passband limit, lower
		145.810	General Beacon

Mode L: (No longer operational)

Source: Amateur Satellite Report 60/61, August 1, 1983 as amended

Fig. 2.

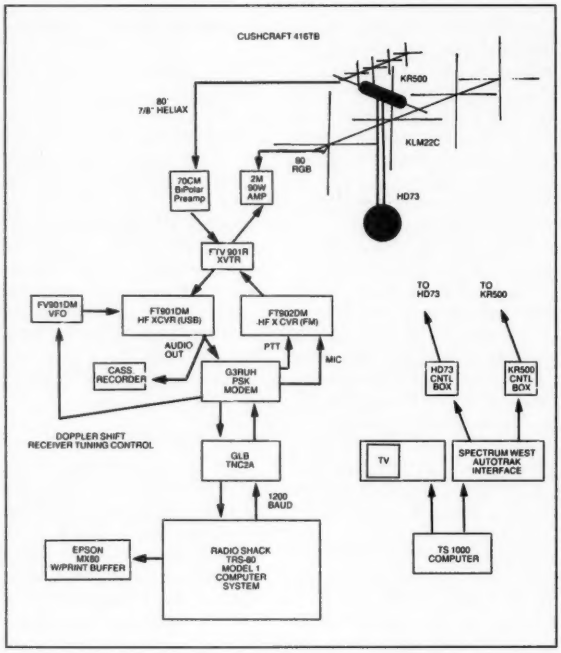

Fig. 3.

ATV

Mike Stone WB0QCD
PO Box H
Lowden IA 52255

STARTING AN ATV CLUB

This month, I'd like to speak about getting an ATV club started in your local area. When you're trying to get people who are interested in Ham-TV (FSTV, SSTV, and FAX) to "pull together" in the same direction, having an organized group or official club is very important.

I am past president and founder of two clubs in my area and secretary of another. I have addressed probably 20 or 30 amateur radio clubs over the past ten years and have promoted ATV, RTTY, SSTV, and FAX at meetings, hamfests, and demonstrations.

Step One

Let's assume you're starting from scratch. You have ATV equipment and one or two buddies on UHF with you. First, establish a clear 2-meter voice operating frequency. It can be simplex or it can be a populated repeater. If it's a repeater, be careful not to monopolize the system talking about the visual modes—there is nothing more harmful to your cause than a couple fellas yacking about their favorite modes night after night, preventing others from using the channel for their own two-way communications.

Most new groups pick a simplex channel to populate—144.340 FM is the most widely used ATV chit-chat spot on the 2-meter dial. Yes, FM is legal to operate down there, and no, you won't interfere with OSCAR communications. Many of us switch to SSB when the band is open and long-range communications are possible. Fig. 1 is a map that depicts where most of the FSTV "audio" activity is established across the U.S. Even if your group is only a handful of people, establish a regular ATV net day and time to meet each week. You may feel awkward calling together such a "net" with the same people you talk to all week long, but the important thing to remember is that you will start to get new "check-ins" who have heard of what you're doing and are interested in getting started. The first time a strange callsign jumps in on your net and asks: "How do I get started?" you'll see the value in having a regular net.

Get in there on the most active FM repeater in your area (just before or after a Sunday night net is a good time) and talk about the fun you are all having with ATV. Send your FSTV pictures and make comments about what you are seeing on the screen across town. Curiosity is your bait—be sure to mention the simplex frequency that you'll be QSYing to before leaving this repeater "fishing expedition." Continue your positive discussion—you can bet a few listeners QSYed with you. They may not jump in and say hello, but believe me, *they are listening*.

To illustrate this point, let me tell you about Paul WB9RZM of East Moline, Illinois. Paul walked up to me at the September, 1986, Peoria Hamfest and said, "Money is no object, how do I get started on FSTV?" After getting over the shock and answering some of his gear-buying questions, I asked him how he knew about our local ATV activity. He replied that six months earlier his VHF police scanner "locked up" on our simplex ATV frequency on two meters. He heard us laughing and having fun, night after night, describing what we were seeing with our at-home cameras and over-the-air UHF TV signals. He could hear the nightly chit-chat and technical discussions of problems, antennas, preamps, and the like. It wasn't really the visual medium that got him to move from "scanner listener" to active ATVer, it was the "friendliness and positive spirit of the entire group" that made up his mind. Today, Paul has a first-class FSTV station with color cameras, VCRs, and the like.

Speak Out

You will have to pay your dues for a few years by giving talks and demonstrations to all the local ARCs and at hamfests. Most hamfest committees will not charge for a table or booth demo setup if you go to them and explain what you intend to do. Even if you have to pay a little, isn't a few bucks spent worth the chance of snagging one or two genuine interested newcomers?

Many of you will have never spoken before a group before. Sure, you'll be nervous, but push that awesome podium aside and casually stand up before the troops near your displayed equipment and just talk about how you got started, what equipment it takes to get going, and what can be done with the mode. Ask for questions from the audience as you speak—don't wait for them to come at the end. These one-on-one exchanges will calm you down a bit. The first few minutes are always the worst. Somewhere, about two-thirds of the way through the presentation, you might even start to like the authority role. There is nothing more fun than to watch a ham be a "ham."

Targets

Who do you aim for in getting a group or club started? I've been most successful targeting in on VHF/UHFers who are already into RTTY, packet, OSCAR, etc., or who are actually building equipment and antennas. Another good sneaky tactic is to set your sights on a very popular individual whom everyone seems to like and admire. This individual should be active in all phases of ham activity (Dave WB0FBP was my target years ago, and boy did it pay off).

Try not to do live demonstrations unless you are sure they will work. Videotapes can be used more eloquently. There is nothing more depressing than if during your "live" P5 color, 3-mile demo someone yells out, "Well, you should see him like that, he's only crosstown." Some folks just don't understand the complexity and the challenge of ATV. Others will.

Don't just talk about equipment—put downconverters (case open) in their hands. Many are amazed that it takes such a little investment to "watch" ATV transmissions. Recently, after one such demonstration of our new weather radar "link feed," 18 ATV downconverters were ordered from P.C. Electronics. The timing was right: It was spring (in time for storms), the link had just been completed, and W6ORG had a $39 sale going on his TVC-4s. We followed up with more meetings to help these newcomers select or build antennas and to instruct them in how to use the ATV repeater system. About half of the people joined the club as associate members to get channel "access" privileges. This brought our total BRATS ATV Club membership to 50. If I had predicted that seven years ago, they would have hauled me off to the funny farm.

Constitution and By-Laws

You've got a following and you're not the only one checking into your established net, so it's time to hold that first meeting. What should you do first? This may vary with different ATV groups around the country, but you should enact a club constitution and by-laws (our club took 7 years before getting around to doing it). Don't let this scare you. Think of these as broad guidelines to go by and a proclamation that you have formed a club. (Send me an SASE and I will be glad to send you a copy or our ATV club's constitution and by-laws.) The constitution and by-laws spell out the purpose of the club, the elected officers and their duties, set membership categories and dues, etc. You can get as specific as you want with the document. It should not be taken lightly, however, and don't be afraid to put several meetings into working out the language. If correctly written, your constitution and by-laws will regulate the politics of your club and things shouldn't get out of hand.

Meetings

The club is formed and growing, so keep the meetings interesting with as many guest speakers as possible. Create projects and group-sponsored undertakings. Building a local repeater or, better yet, a remote transmitter is a good start. Put out regular newsletters, even it it is at your expense for a while. I did this for five years and never regretted it—new interest was generated through those newsletters.

Generating money is the toughest job. Members will quit smiling when you ask them to contribute their fair share towards something. I've come up with a lot of harebrained ideas for our multi-function system, and most members gave generously along the way. Send out tear-off return-mail donation forms with your newsletters. Publish the callsigns of those who contribute. Peer pressure works.

Goals

Don't get unrealistic in setting your club's goals. Too many well-intentioned ATV groups want to do everything "right now." You should take things one step at a time. Plan out each step of progress in building the system. Involve everyone in the decision making.

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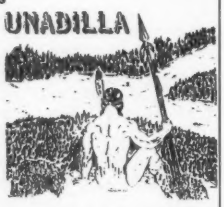

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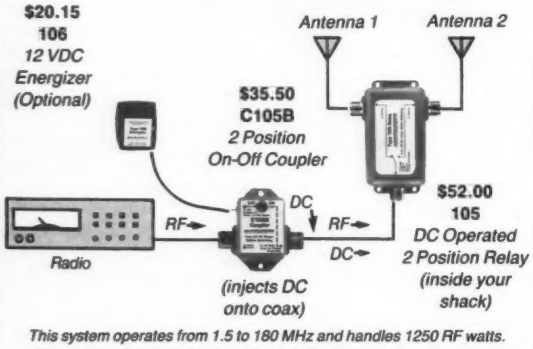

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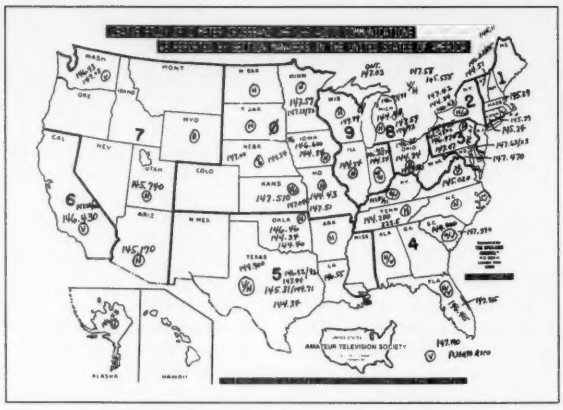

Fig. 1. A map of FSTV "audio" activity in the U.S.

areas often are built by individuals at great personal cost (money and time). Once the system is up and going, then the masses descend. Later on, most won't realize or recognize the work that went into building the system. A good example of this is what's been happening in Chicago recently:

Henry Ruh KB9FO, Dave Miller K9POX, and Jack N8GKO have been building up the KB9FO FSTV repeater and remote transmitting system (439.25/426.26). It will be Chicago's first such unique system, and activity to date in the Windy City has been pretty dead, to say the least. The KB9FO ATV/R system began testing a weather radar feed (from WMAQ-TV) in late December of 1986. Legal touchtone™ control (Part 97.88) by supporting Peacock ARC members began in May of this year. Initial opposition to this system came largely from one individual who objected to just about every phase of the system, declared it "illegal" and immoral, and even turned in supposed violations to the FCC. These supposed violations were declared invalid. Every time I hear this negative-thinking individual and his crumbling crown of simplex authority on the air, I think of *Star Trek II* when Spock says, "The needs of the many are outweighed by the needs of the few." Don't let anyone bully your ATV group off of its set goals. Try to listen to, reason with, and and cooperated with all involved, but if a thorn in the side persists, "Beam the disease out into space oblivion, Scotty."

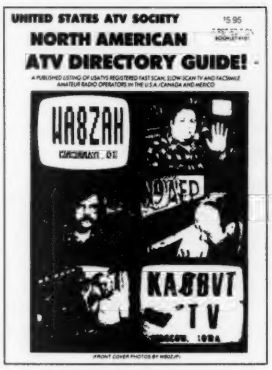

Fig. 2. The North American ATV Directory Guide.

August FSTV Contest

I'd like to invite everyone who's active on FSTV to participate in the sixth annual *Spec-Com Journal*/USATVS North American FSTV QSO Party and DX Contest. This is the only ATV contest of its kind in the U.S. and it comes but once a year. It is a week-long contest to make the gathering of UHF signals more relaxed and to better take advantage of summertime propagation. The contest is from 0001 local time on Monday, August 17, through 2400 local time August 23. Complete rules and guidelines were published in the June/July and August issues of *Spec-Com Journal*. Back by popular demand is split receive and transmit scoring; new for this year is limited acceptance of repeater contacts (50% penalty). The rules are fairly complicated, so send an SASE to the address at the beginning of this column to receive the contest rules and log sheets.

The *North American ATV Directory Guide* is available from the same address for $6.95 ppd. When the commercials start appearing, it's time to change channels. Next time, details on the Pitcairn Island Color SSTV DXpedition. See you on the tube.■

LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Ave.
Saugus CA 91350

NEXT IN BAND PLANNING: THE COORDINATOR LOTTERY

Choosing who is and who is not a legitimate amateur radio repeater frequency coordinator could be done by simple lottery if the FCC is forced to make such decisions. This amounts to a warning to feuding repeater coordinators that's been issued by FCC Special Services Division Chief Raymond A. Kowalski. It came in a telephone interview with Ray on May 13 during which he specifically asked that I pass along the gist of his words: "If a method like arbitration cannot be found or agreed upon and it does come down somehow to the FCC to decide [who is the legitimate coordinator], I'll tell you how we will probably decide—by lottery." For those unaware, in a lottery-type situation, anyone who wanted to become the recognized repeater coordinator for a given geographic area would apply to the FCC for this privilege. Then, on a given date, all the applicants names would be put into a giant "hat" and one name would be drawn as the winner. That person or group would then become the sole legal coordination entity for a specific geographic region to be recognized by the FCC. Experience as a frequency coordinator or longevity in coordination would mean nothing. The selection would be by random chance.

Kowalski states that the selection "resides within the locality where the principals are, and if they cannot come up with something locally . . . I don't know how they can expect people in Washington to decide." He added, "I don't think anybody would be too happy with a decision from Washington."

But I've Been Coordinating Repeaters for Years

Regarding longevity as the criterion for determining a legitimate frequency coordinator, Division Chief Kowalski noted that this cannot always be counted on: "It's been our experience that shenanigans sometimes go on under the authority of the "old-timer" on the block, or a new crowd comes in and finagles control of a coordination council. While I would agree that the established and long-recognized coordinators are the ones who should have, and in fact do have, a leg up, we always remain open to the possibility that there may be some reason by which they may forfeit that right."

Arbitration and the ARRL

Kowalski also indicated that the time has come for feuds between long-established, newer, and made-to-order coordinators to come to an end. At the Dayton Hamvention, Ray suggested that binding arbitration might be one way to solve the disputes. He expanded on the idea by suggesting that sources of such arbitrators might come from a professional arbitration service or could be drawn from the ARRL's pool of lawyers who participate in the League's Volunteer Counsel program.

It should be noted here that, to date, the ARRL has steadfastly refused to become directly involved in matters of frequency coordination or development of political policies in that regard. The only aid provided to repeater coordination and band-planning efforts by the League has been in the area of long-term Advisory Committee studies and board approval of a small number of band plans, with the proviso that local option to these ARRL-approved band plans always supersedes the national nature of the plan itself. The ARRL is also working toward the establishment of a communal data base for information exchange between frequency-coordination entities, but will not give itself access to it. Nor will it take any active part in maintaining the data base other than providing incoming telephone access to it and physical hardware repair. Based on this, it isn't known whether the League's Board of Directors would authorize an activity such as their Volunteer Counsel acting as an "arbitrator" in disputes between frequency coordinators since this would place the ARRL and the lawyer acting as arbitrator in the position of legal liability for the outcome of the arbitration hearing, unless both (or all) parties involved in the dispute were first willing to sign a "good faith agreement" releasing the arbitrator and sponsor from legal responsibility.

Where the Problems Are

Currently, the only known disputes between frequency coordination entities are in Kansas/Missouri, California, and Alabama. However, any decisions made by the FCC concerning any of these three will impact on volunteer frequency-coordination efforts throughout the United States and its possessions. Let's look at what's happening with all three.

Alabama is the easiest to report on, since that one has been quietly winding itself down for the past year. All sorts of problems beset Alabama almost two years ago when the then-leadership of the statewide Alabama Repeater Council decided to move Alabama to the Pacific Northwest 20 band plan. Now, if you were to look at a map of who is using what band plan where, it would become immediately apparent that going to 20 kHz would not be popular with Alabama's neighbors. All of them were already 15 kHz upright in accordance with the ARRL 2-meter band plan. It wasn't the change to 20 kHz itself that angered a goodly number of repeater owners. It was the way in which the decision was made. It was made in a "do it now and we'll discuss it later" fashion.

As a result, a large number (or a small number . . . it all depends on which side you are listening to) of system owners decided to abandon their local council and seek representation through the neighboring CVRA-Southeastern Repeater Association. Not wanting to be charged with plundering a neighbor, CVRA-SERA put the issue on indefinite hold, probably in the hope that it would cool down by itself. For CVRA-SERA, it was a wise decision but it did not help restore order in Alabama. FCC officials ended up doing it. Rather than see a bad situation grow worse, members of FCC Atlanta Georgia were asked to be mediators in this affair. I don't exactly know what was said in the meetings with the rival factions in April and May of 1986, but things were worked out. As a result, the Alabama Repeater Council is well on its way to recovery! Oh, I still get letters from disgruntled repeater owners in Alabama, but these are becoming few and far between. Which band plan they are using? The last I heard was from Sam Davis NR4A last fall. He said at that time it was being left up to the repeater owners as to whether they wanted their system on a 15- or 20-kHz center. If any shift in this policy has taken place, I am not aware of it right now.

The California issue is quite a different matter. Rather than rivalry between members of a single group, as was the case in Alabama, the issues in southern California are between two repeater coordination entities that both claim domain over the same piece of spectrum. Kowalski confirmed that he had written a letter to Daniel Granda KA6VHC requiring him to provide proof that the repeater council with which he is coordinated is the valid coordinator for the 220-MHz band in southern California. Ray explained it this way: "At this point, Granda's repeater operation conflicts with another repeater operation. The other repeater has been coordinated by the 220-SMA (220-MHz Spectrum Management Association of Southern California); Granda's repeater apparently has been coordinated by an outfit called 220-FCC (220-MHz Frequency Coordination Commission). So we have asked Mr. Granda to tell us more about his coordination before we make any final determinations about whether or not he actually does have frequency coordination." The 220 Frequency Coordination Commission is a newly established coordination organization. Almost every other system operating on the 1-1/4-meter band in the same geographic area has been coordinated by the long-established 220-MHz Spectrum Management Association of Southern California. This group came into existence in 1979 with the dissolution of the old Southern California Repeater Association into 220-SMA and the Two-Meter Area Spectrum Management Association. The SCRA in turn traces its ancestry right back to the original California Amateur Relay Council. CARC was the world's first repeater-coordination body, being founded in the mid-50s. And, as I learned just the other day, while the CARC has not been active in almost two decades, its corporate charter has never been cancelled. As such, it could easily be reactivated at any time to become the official California statewide repeater and band-planning council if need be. Will it be needed? Only the FCC can answer this one. And that brings us to the Kansas City

vs. the Kansas State and Missouri State councils. Frankly, I'll need a whole column to describe that mess. It's a humdinger, and I will try to explain it next month.

FCC vs. IARN

You have probably never heard of Glenn Baxter K1MAN, but the FCC has. The Commission has served him notice that his assistance to the CBS News Network during the October, 1986, El Salvador earthquake may have been a violation of FCC regulations on the use of amateur radio for business communications purposes. During the early hours of the devastation of the tiny Central American nation, Baxter's International Amateur Radio Network was one the few links between the media and the earthquake-stricken nation. In fact, during the hours just following the quake, there was no way for anyone to accurately determine whether any other means of communications existed. Phone service to El Salvador existed, but service to the destroyed portions of the capital city of San Salvador was wiped out. Baxter thought that he was providing a service within the framework of the spirit of the amateur rules, but now he has been informed that his well-meaning efforts may carry with them some severe penalties.

What the FCC Said

The Commission notified Baxter of the apparent rules violation in a letter from Personal Radio Bureau Chief John B. Johnston W3BE, based on a letter of complaint to the FCC from Col. Thomas J. Kay of Panama City, Florida. Kay wrote to the FCC based on his monitoring of the K1MAN/IARN operation. He wondered about its legality, and supplied the FCC with a tape that included "apparent instances" of interviews being conducted by CBS network reporters using the facilities of K1MAN's station. The Commission letter to K1MAN questioning his activities is as follows:

"We have received a complaint about an amateur radio contact between your station, K1MAN, and station HC2DZ/YS1 on the frequency of 14.275 MHz, on October 10, 1986, at approximately 4:05 p.m. (EDT). The complainant provided a tape recording of that contact. That recording and a newspaper article you recently sent to us indicate that your station was being used by Marc Singer of CBS News to conduct interviews and to gather information concerning an earthquake in El Salvador.

"Section 87.110 of the FCC rules prohibits business communications by an amateur station, except for emergency communications. Emergency communications as defined by 97.3(w) of the FCC rules are amateur radio communications directly relating to the immediate safety of life of individuals or the immediate protection of property.

"Section 97.113 of the FCC rules prohibits amateur stations from engaging in any form of broadcasting. An amateur station may not be used for any activity directly related to program production or newsgathering for broadcast purposes. News information may be conveyed by an amateur station only when all of these conditions are met: (1) the event is unforseen; (2) the news information is directly related to the event; (3) the event involves the safety of human life or the immediate protection of property; and (4) the news information cannot be transmitted by any means other than by an amateur station because of the remote location of the originating station or because normal communications have been disrupted. If alternative communication facilities are available, an amateur station may not be used to convey the information."

Baxter Fights Back

In his preliminary response to the citation sent on February 29, Baxter noted in part: "...be advised that Mr. Singer at CBS News and I were well aware of the rules cited in your letter at the time of the San Salvador communications crisis in October, 1986, and we were both taking pains to comply with those rules while simultaneously providing an important public service."

Baxter says that the information generated during the nine-hour period that CBS News was continuously connected to the phone-patch facilities at amateur radio station K1MAN via an open line between Belgrade Lakes, Maine, and New York City was that first, the U.S. Embassy was completely destroyed, and later, there were no U.S. Embassy casualties. Mr Singer and I made every attempt to get every scrap of information to confirm and verify this conclusion throughout the connect period.

Also, per request to radio station K1MAN from BBC London, CBS and I obtained all the information we could from every available source and passed this information to the BBC as they were understandably frantic about the 80 British nationals in San Salvador and planning a British rescue effort for British citizens. CBS and K1MAN were also very concerned about Andy Triaz, a CBS reporter in San Salvador who had not been heard from and who was not communicated with by CBS until the following day.

Finally, since K1MAN's only phone line was tied up for the nine-hour contact period, CBS News staff in New York made scores of outgoing telephone calls with messages from San Salvador. I am quite proud of the very professional manner in which both CBS and amateur radio station K1MAN acted in this matter.

Baxter's reply to the FCC allegations against him also included a formal request for a copy of the letter of complaint from Col. Donald J. Kay and a copy of the audiotape filed to the FCC by Kay with his letter of complaint. K1MAN has also written to CBS Network Anchorman Dan Rather, to advise him of the complaint. Unknown is why Col. Kay filed this complaint in the first place and what punitive action, if any, the FCC may be contemplating against CBS News, K1MAN, or both.

My View

This editorial comment is not in support of K1MAN or of any claims he may make. Rather, it is a short essay on our times, and does not necessarily reflect the views of anyone else at *73*.

It is becoming very apparent that those who write and enforce the FCC rules have no idea of the "real world" outside their offices, especially the "real-live" world of gathering and disseminating news during crisis conditions. Being employed by a television station and proudly allied to its news operation, I happen to understand what the FCC does not, namely, when there are people hurt and dying in a foreign land and who have relatives here in America who are worried about their welfare, the FCC PART 97 RULES CAN BE DAMNED! The needs of the many definitely outweigh the bureaucratic needs of the Washington few. If ham radio is the only way to get the word that Americans are seeking, then so be it!

For the record, as far as this reporter is concerned, Part 97.113 of the FCC regulations stinks. It impedes the very purpose of the amateur service as outlined in Part 97.1. Part 97.113 by its very nature is archaic and it should be done away with. If I found myself in the position of K1MAN, I would take the same course of action since, to paraphrase once again, the lives of the many are more important to me than the rules of the few.

About a year ago, I was discussing this very issue with a high-ranking FCC official who shall remain nameless. His contention and that of his staff was that the rules are so tightly written in order to prevent the "...Amateur Radio Service from becoming the Amateur Radio Broadcasting Service," that is, to prevent broadcasters from using hams and amateur stations as a way of cost-cutting in the newsgathering process.

The FCC supposedly trusts us enough to give one another tests and to police our bands for regulatory violators. Isn't it time to let us decide what is and is not an emergency and to act in accordance with what we believe is the best interest of all concerned? If this is not the case, then it's incumbent on the FCC to reassume testing and all phases of regulatory enforcement. since this so-called "trust" does not really exist at all.

Finally, this is a view a lot of you won't like, but read on, anyway. I consider myself to be a realist living in a real world. This being the case, if it ever comes down to becoming the "Amateur Radio Broadcasting Service" or having ham radio disappear altogether, I vote for becoming allied to the broadcast community. First of all, a goodly number of people in positions of power in broadcasting are already licensed amateurs. The industry has far more money and more political clout then we will ever have alone and would make good allies, especially in times when our bands are threatened, such as the present! Have you already forgotten the General Radio Docket 87-14, that FCC-generated fiasco?

I have lots more to say on this, but unfortunately we are out of time and space. That's all from the soapbox this month from those of us who write the late shift in Los Angeles.■

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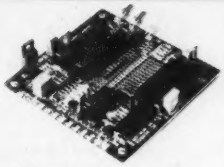

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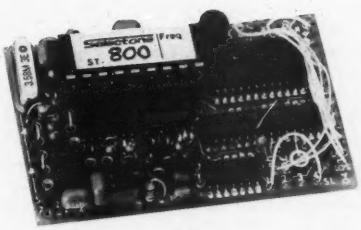

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THE AEA PK-232

Those of you who have been following this column for the past decade or more (and, judging from your letters, cards, calls, and E-mail, I know that there are quite a few) are probably quite aware of my love affairs with various computers. Well, a new box has graced the shelf at WA3AJR, and while it is a computer of sorts, I think it would be a welcome addition to even the most compuphobic (another point for the neologists) amateur. I alluded to the AEA PK-232 interface unit last month, and from what I have seen so far, it may well be the ultimate answer to the ham wishing to enter the world of digital communication.

Let's have a look at some specs. In this little box, about the size of a sheet of typing paper and 2-1/2" high, is the capability to run RTTY, Baudot/Murray, ASCII, AMTOR, Morse, packet, and FAX using only a dumb terminal or essentially any computer capable of communicating with a modem. I won't show you a picture of the thing, as I'm sure AEA is running an ad somewhere in this magazine, so if it really bothers you, go ahead and look that up now—sneak a peek at the front panel and then come on back so that I'll have your full attention.

About the only way to tell you about this thing is to go through its modes, step by step. That way, I'll try not to forget anything (although the word processor helps me hide those blunders) and you can skip paragraphs which refer to modes you are not interested in.

Provisions are made on all modes to run in several interface systems. Input can be either receive audio or TTL level to an external modem. Outputs to the radio may take the form of transmit audio, either positive- or negative-keyed line for CW, and direct FSK, as well as a modem output. Additionally, for those who get off on dancing ellipses, oscilloscope outputs are provided as well.

There are front-panel indicator lights (LEDs) for mode, status of packet, AMTOR, ASCII/Baudot, and . . . well, uh . . . just about anything the box is doing at the moment. It may be a backwards tribute to the designers, in fact, that the one thing I needed the manual for the most was to understand the damned lights!

Also on the front panel, by the way, is a ten-segment LED bargraph display which displays the audio frequencies being tuned. I assume that this is some kind of discriminator. A threshold adjustment and a push switch for two radios complete the rather full complement of front-panel khazzeri. As I said, have a look at the ad if you want to be impressed by rows of LEDs.

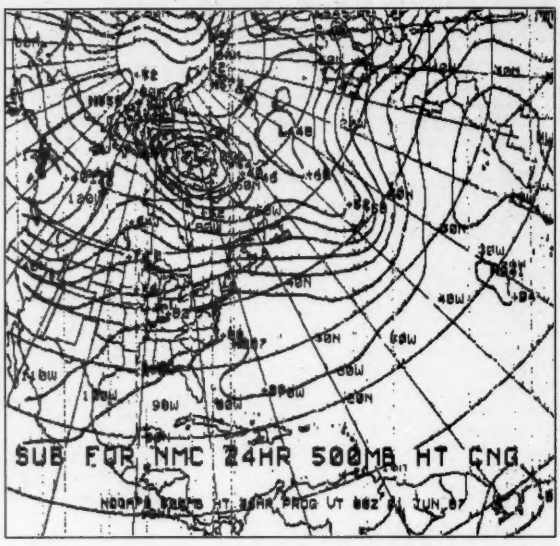


Fig. 1. Weather map processed by the PK-232.

Morse

Anyway, using this high-tech box on low-tech Morse is reasonably straightforward. Once set to Morse mode, the PK-232 will track the receive speed automatically and, if desired, the speed can be locked in to avoid glitches from static crashes or interfering stations. As far as transmit speed is concerned, it can be specified as anything from 5 to 99 words per minute. Incidentally, at speeds under 15 wpm, the characters are sent at 15 wpm and the spacing between characters is lengthened to yield the requested speed. This is in keeping with many code learning theories (right, Wayne?).

In Morse mode, characters can be sent as typed or by the word, and special CW groups from AS> to SK>, and then some, are supported. In essence, running Morse on a PK-232 looks like RTTY!

Baudot

Up a notch is Baudot (which we call Murray) operation. Setting the mode to Baudot brings forth a whole slew of options. Standard rates of 45 to 300 baud are supported, which cover the spectrum from 60-wpm RTTY (old style) to faster than I care to think about (almost 400 wpm). You can force LETTERS, FIGURES, send your callsign at the touch of a key, or even send a CW ID if you like. An option that may be turned on or off is Unshift On Space, which is very useful with QSOs but annoying if you are copying columns of figures, as with weather reports. A simple ON or OFF command is all it takes.

One feature I have seen nowhere else is support for the international version of the Baudot code, CCITT ITA #2. Upon command, characters typed may or may not be translated into this internationally recognized alphabet. And yes, the manual even tells you the differences, and when to use what.

ASCII

Although I don't think there is as much ASCII RTTY around as Baudot, this mode is supported as fully as Baudot on the PK-232. Baud rates up to 300 are supported, with the added feature of being able to shift up or down one step without having to specify a specific rate. Of course, the full ASCII character set is supported, and that venerable CW ID is even available. I should note that this is classic seven-bit ASCII, not the eight-bit "parity-added" variety sometimes bounced about, so noise errors may be a problem. But that's why AMTOR was born.

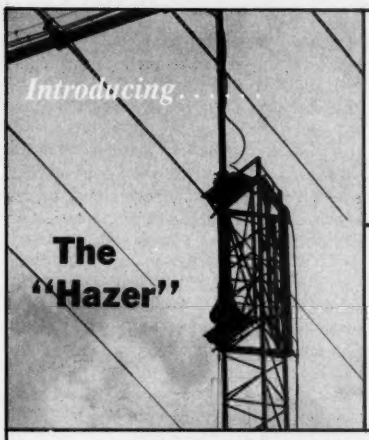
AMTOR

We haven't talked too much about AMTOR in the past few years, other than an overview some time back. In part, that is because so few of you have expressed an interest in the mode to me, and in part it has been because of the paucity of equipment to run AMTOR. Well, if the latter is true, then the PK-232 should do much to alleviate the shortage.

AMTOR is covered at some length in the PK-232's manual, even including thoughts by the guru of the mode, Peter Martinez G3PLX. For those who have never operated this error-correcting form of RTTY, the two operating modes, ARQ and FEC, are covered, with hints which one to use when. Starting and maintaining QSOs, developing a unique SELCAL, and use of the ARQ break-in technique are all covered. In short, AEA provides enough documentation to help get you started on what to many is an unknown mode.

An aside, if I may. It occurs to me at this point that maybe, just maybe, some more on AMTOR may be appropriate. Is it? If you would like to see more on this spur off the line, let me know. As I said, lack of expressed interest is at least half of the reason I haven't said much on the amTORPIC (sorry!).

Getting back to the PK-232, you have your ARQ and FEC modes, as well as selective FEC mode. All kinds of options are supported, whether you want to engage in round-table, traffic, or bulletin-type operations. Speed is set at the 100-baud rate legislated for AMTOR operation. And all kinds of helpful hints and tidbits of information are given for this mode of operation. Like I said, the PK-232 just might encourage AMTOR experimentation by amateurs who bought it for its obvious forte—packet—and decided to try another option.



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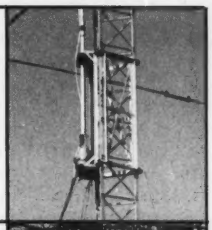

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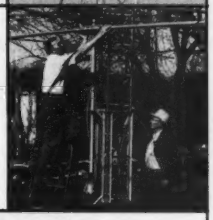

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Packet

Did I say "packet"? Clearly, the PK-232 enables users with most any station capable of operation on packet frequencies and a terminal to enter this exciting new mode. As with AMTOR, there is a lot of information in this manual about packet, although it is not packaged like the tutorial for AMTOR. Although it should suffice to say that the PK-232 can do anything possible on packet, perhaps some examples would be in order.

To begin with, radio data-link rates of 45 to 9600 baud are supported, with the default being 1200 baud. Automatic operation, beacon operation, digipeater operation, and auto-answer are all easily implemented. You can set up a list to accept or reject connections from up to eight callsigns. You can leave a message, kind of a "Packet-o-Phone," to be sent if someone connects with you and you're not there. You can even set your station to monitor the channel, but connect with no one, and digipeat nothing, even if requested.

Speaking of monitoring, the PK-232 allows you to monitor activity on the channel ranging from round-table unconnected frames to every blessed thing on frequency, even if the error correction is wrong.

If you're a yenta, the PK-232 can provide all kinds of information in the most revealing mode. Different types of packet frames, frame numbers, and other information are discernible.

A real-time clock is also onboard, although it is not maintained when you power down, which can date- and time-stamp monitored signals.

About that power down... the PK-232 has an internal battery, made of three AA-size cells, which maintains your callsign and default information, such as last mode used, etc. It does not maintain the calendar or clock, though. (Working on that one, guys?)

Back to packet, the PK-232 supports up to ten multiple-connect channels, with channel switching enabled on any user-selected key. Of course, a full display of all channels in use, and who is where, is also available. Who needs a dedicated display?

All in all, the PK-232 provides fully capable packet station operation, which should satisfy everyone from the beginner to the advanced operator. For the beginner, by the way, the manual has a section that appeals to those of us who just can't wait to get on the air. And, when confronted by the 1.5-cm-thick book that accompanies the PK-232, who can blame us? Anyway, a "Quick Start" section takes you step by step through initial testing, installation, and operation quickly and painlessly, and almost holds your hand if you have problems.

FAX

As if all that wasn't enough, the PK-232 has two more features that stand to knock the socks off the rest of the boxes on the shelf. The weather map in Fig. 1 was received here at WA3AJR on 3.357 MHz, processed by the PK-232, and printed on an Epson-compatible printer. The PK-232, you see, has a FAX mode that allows the reception and transmission of pictures using the FAX technique.

Reception of FAX transmissions on HF is one of the easiest things I've done in ham radio. All you need to do is connect the printer to the PK-232, using a supplied cable, and the computer or terminal to the PK-232 using the same cable (it's a "Y" in case you haven't figured that out), set the mode to FAX, and tune in a FAX signal. Here in the East, 3.357 MHz comes booming in, and the manual gives other suggestions. Lists of frequencies are frequently published here in *73*, as well as being available on Delphi and CompuServe.

Data can be printed or, if a computer which can save eight-bit data is connected, saved to disk for later printing. Or, it can be transmitted from disk or other modality, with the PK-232 able to do all the work in that regard. Look at that chart and realize that little effort went into receiving it. Remember also that not only charts, but satellite photos, and even news photos (if you find the frequencies, let me know) are out there, all for grabs with a receiver, printer, and PK-232, then tell me you're not impressed. Humbug!

SIAM

Well, if that does not impress you, this will. The PK-232 can tell you what you're listening to. Not with 100% accuracy, but it's a lot better than your ears. With a mode called SIAM, standing for Signal Identification and Acquisition Mode, and trademarked by AEA, the PK-232 can identify the type and speed of digital signals, and has the Russian Cyrillic and Japanese Katakana character sets as part of its repertoire.

After setting the appropriate mode and tuning in a signal, the PK-232 will indicate a confidence level, such as 0.50, if it is 50% sure, 0.68 if 68% sure, etc., and what it thinks the signal is, i.e., Baudot, ASCII, AMTOR, noise, or a few others. If it is a signal which the PK-232 can print, typing "OK" will enable reception of the signal in the selected mode. Then it's up to you. Now, that's got to impress you!

Cost

I think you will agree that the AEA PK-232 represents an outstanding interface, filling a wide range of functions in the modern amateur station. What's that I hear you asking—the price? Well, the PK-232 lists for about $320, and I called around while writing this column and got varying dealer quotes with some under $300, so discounts are available. Now, before you get all hot and puffy about that price, let me point something out. In 1973, a brand-spanking new HAL ST-6, a unit which remained a standard of comparison for many years, sold for $360. That's $360 1973 dollars, not 1987 dollarettes! I'll leave it to the statisticians among you to let me know what that would be in today's currency, but the value for the dollar is apparent. The PK-232 is some fine piece of gear.

I'm sure that AEA would be happy to send you more literature; just drop them a line. They've finally gotten out of that PO Box they were in for years—never could understand how they could work in such cramped quarters, anyway! Send notes to AEA at 2006 196th Street SW, Lynnwood, WA 98036, and don't forget to tell them you read about it in *73*'s RTTY Loop!

Hmm, looking around the page, it looks like I've about used up my space. I have some books over here to tell you about next month, then some more on tap after that. Well, with September around the corner, reading for next month seems in order to me. Don't miss the next literary edition of this individual's rippling RTTY Loop! ■

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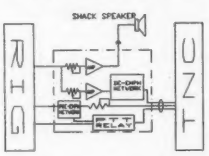

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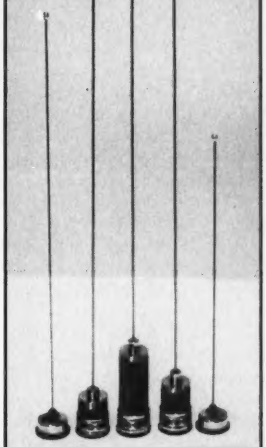

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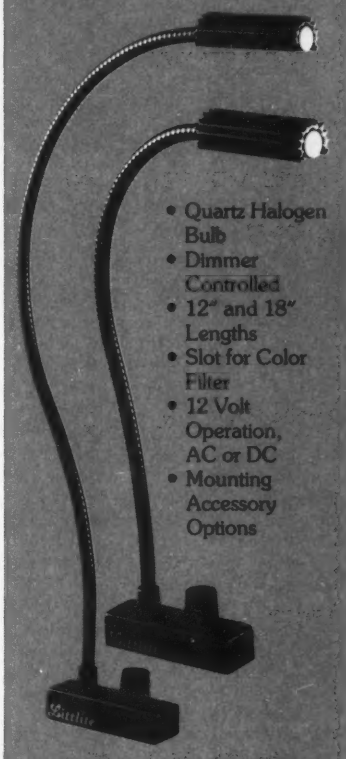

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WEATHERSAT

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PROBLEM SOLVING

Shortly after the middle of May, I returned from a week in Washington (paleontology at the Smithsonian, not satellites) to discover that the WEFAX-receiving installation was delivering noise instead of the expected satellite signal. What follows is a practical exercise in fault isolation that becomes second nature to experienced satellite diehards.

Step one was to ensure that all elements of the system were still powered up and properly interconnected. Seems simple but it is amazing what can happen around the house when you are gone for any significant period!

Step one was a washout—all cables were in place and everything was properly supplied with DC at the proper voltage. Step two is a quick one—scope out the antenna to ensure that it hasn't been knocked out of alignment by a windstorm, low-flying UFO, or an exuberant insulation contractor. Step 2 was also a washout. Too bad, now we have to go beyond the simple "is it plugged in?" to the "is it working?" stage!

Step three involves some basic rf checks. The first one is easy. Using a 137.5-MHz weak signal source such as the one in the *Weather Satellite Handbook* (WSH), (3rd Edition, available from Richard Taggart for $12.50; postage and handling: U.S. $1, $2 elsewhere), it should only take a few minutes to confirm that the VHF receiver is still functioning.

That leaves the S-band part of the system, and weak-signal sources for 1691 MHz are harder to come by. Years ago I purchased such a source from Paul Shuch at Microcomm (14908 Sandy Lane, San Jose, CA). I have this source hooked to a feedhorn and shooting out a basement window. The whole thing is arranged so that I bounce enough rf off our local water tower to produce a full-quieting signal. This approach has an advantage in that it tests the *entire* S-band system—antenna, preamp, feedline, and converter. Incoming signal levels were right where they should be so where was the satellite signal?

At this point we can either fire off a frantic call to Washington or engage in some productive head-scratching. Since we are talking about a Sunday afternoon, the Washington option will have to wait; I am left with nothing more than rational analysis!

The recent successful launch of the GOES East replacement has restored a measure of order to the U.S. geostationary program. A new GOES E is on station and the spacecraft that has been serving double-duty at a position intermediate between the normal GOES E (70°W) and GOES W (135°W) positions has now been maneuvered over to the normal GOES W slot. My particular elusive spacecraft is GOES Central. This bird is normally parked at 107°W but has spent the last year at 114°W while the entire system was making do with a single imaging spacecraft. What if they have moved it back 5 degrees east while I was palavering in DC?

I always hated dish realignment sessions, mostly because they involved so much extra work. I have used all sorts of techniques in the past to optimize alignment. One gimmick was to set the ATV station camera up on the receiver signal strength meter and then haul a TV out to the antenna site to watch the meter as I tinkered with elevation and azimuth. At other times I would simply run a long audio line out to the antenna and use a pair of headphones.

The approach I use now is far easier. About a year ago I purchased a set of 49-MHz two-way FM transceivers from Radio Shack. Similar units are available from a number of outlets. The radios clip on a belt and feature a headset with a microphone and whip antenna. I simply take one of the units and set in up next to the station receiver with the system set on VOX. I put on the second unit, stroll out to the antenna, and proceed to adjust the antenna while listening to the results. Two-meter radios have a tendency to desense some satellite receivers but the extremely low-power 49-MHz units present no problems.

Swinging the antenna a bit off toward the east brought immediate results and I was sure that I had found my wayward satellite. The system was peaked in both azimuth and elevation, but although the signal was plainly audible, it was *not* full-quieting! Noise was clearly evident at all times—yet just a week previously I had over an 8-dB gain margin with my four-foot (1.2 meter) dish! Although I had found the spacecraft, it was quite clear that I wasn't out of the woods yet!

As I finally got the old gray cells into high gear it became obvious that the GOES C I was watching could not possibly be the same spacecraft I had been monitoring prior to my trip. Regular readers will remember that a few months ago I was explaining why GOES C signal strengths were so variable during the course of a day. The aging spacecraft simply did not have sufficient fuel to correct for progressive plane errors in its orbit and it was now drifting over five degrees above and below the equator each day. Given the fuel situation, there is no way they would have been able to initiate an eastward drift to a new operating station! It was also clear that this spacecraft was *not* showing any plane error significant enough to cause a shift in downlink signal strength. The conclusion was inescapable—they must have switched over to a new spacecraft. With that much decided, I could make a major deduction—sitting over 22,000 miles from the mysterious bird—that it probably bore a Hugh's nameplate!

To understand that bit of Sherlockian wizardry you have to know just a bit more about the genealogy of the GOES spacecraft. All of the original SMS/GOES spacecraft had been manufactured by Ford Aerospace, yet all the recent operational spacecraft in the series have been manufactured by Hughs. The two spacecraft are *almost* identical in functional terms but the difference is *not* trivial. The original Ford spacecraft transmit the equivalent of horizontal polarization. If you are essentially north or south of the spacecraft, the downlink signal will appear to be horizontally polarized. In contrast, the same geometry with regard to one of the Hughs' spacecraft will produce a signal that is *vertically* polarized. It is important to realize that GOES C is always a "used" spacecraft. Almost always, failures of operational spacecraft involve some aspect of the complex imaging system so that when a particular spacecraft is eventually replaced, the old one is shunted aside to a parking orbit, often with a perfectly functional transponder. It is from this pool of "used" spacecraft that candidates for GOES C are selected since the central spacecraft is required only to relay WEFAX, not do any imaging. Since I prefer monitoring GOES C, I have left the antenna feed essentially horizontal. If my prediction was correct, the powers that be had finally worked through their supply of old "Fords" and were now using a "previously owned" Hughs with a mere hundred million or so miles on its orbital odometer!

The theory was easy to test, for if it was correct, I would merely have to switch the feed over to vertical to restore my usual gain margin. A few minutes back at the

Photo A. The author's 1.2-meter dish mounted outside a convenient window.

antenna to switch from horizontal to vertical, and *voila*—back in business with a full-quieting signal and an even bigger gain margin than I had enjoyed previously!

The take-home lesson from this is really quite simple. When something as complex as a satellite system suddenly goes out, the key is a systematic step-by-step approach to discover what the problem might be. A complete check of the ground station gear should always be step number 1. Take the checks a step at a time and do not *assume* that you have had a catastrophic failure. That is always possible but is rarer than you might think.

The point is, you need to be sure before you hit the network, either by phone or bulletin board, with questions about what happened to satellite X. If there has been a change in the status of a particular spacecraft, you will eventually hear about it, but if you have to wait for the periodic information notes, you may have torn your system down to bare components in the meantime! If the system seems to check out, contact other operators by phone or BBS to confirm any possible operation problems before hitting the phone lines to Washington. The amateur satellite community has a hard-earned reputation for reliable reporting of system anomalies, and we don't want to risk that standing by careless reporting of problems that may exist in *our* hardware and not theirs!

By the way, a later check via the bulletin board network confirmed that GOES 5 (a Hughs spacecraft) was now serving as GOES C with all other spacecraft on station (GOES E at 75°W, GOES C at 107°W, and GOES W at 135°W). GOES C presently has a 0.5 degree plane error which should result in minimal daily signal changes at the moment. There is *no* fuel reserve for plane changes, however, so expect the plane error to accumulate with time!

An Alternative Dish Antenna Mount

I have operated a GOES WEFAX installation for a number of years now, and for most of that time I have had my dish antennas mounted on posts out back, running long lengths of coax to get the signal back to the station. This requires that I keep converters in weatherproof boxes out at the antenna site and presents serious problems with temperature drift with some converters, given the extremes of our Michigan climate. This arrangement also insures long treks out to the antenna farm to make adjustments, and that is definitely not fun in the dead of winter.

Photo B. Jack Hawkins' (WB6WJQ) scan converter-based satellite station. The 512K Radio Shack Color Computer 3 (lower center) handles the imaging chores in conjunction with Jack's version of the WSH scan converter in the cabinet on the left side of the middle shelf. The cabinet at the center of the middle shelf contains the station power supply and the station antenna control while the Hamtronics R75A custom-packaged kit receiver is on the right. The upper shelf has two monitors, one for the computer menu (left), and the other to view the output of the scan converter, like the large-screen monitor to the right of the shelf unit.

A roof-mounted antenna was out of the question for a number of reasons. The most important of these is that I live in a 100+ year old Victorian house and I won't get up on most of the roof in the summer, let alone in the dead of winter! For a long time I did dream of having the antenna a good deal closer to home, if only to let me keep my converters in the more benign environment of the house! About two years ago I opted for a new approach to mounting a dish, an approach which might be applied by any of you, if you have a window or wall that faces in approximately the right direction for a particular geostationary spacecraft.

The mount is designed to mount on a wall or window frame while providing complete freedom of azimuth adjustment over almost 90 degrees. The main component is a triangular frame, shown in sketch form in Fig. 1(a). The frame itself is made of punched steel angle stock, available at most hardware stores. A stock length for this material is three feet and the vertical and horizontal members are made up of single pieces of angle stock.

The longer diagonal member is made from two pieces, doubled over most of their length. The triangle is simply bolted together using 1/4-inch hardware and no drilling is required since the angle stock is punched every inch on both sides.

The vertical member has two heavy-duty hinges bolted on, one at the top and one at the bottom. These hinges in turn are bolted to the window frame or wall, enabling the frame to swing like a gate, through an arc of over 90 degrees. The antenna, a Metsat GR-4 in my case, has a horizontal mounting tube at the back, and this tube is secured to the horizontal arm of the triangle using "U" clamps. The clamps provide a secure attachment yet permit the dish to pivot on the mounting tube for elevation adjustment.

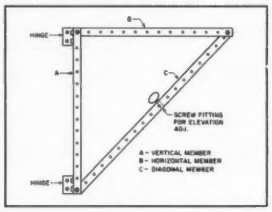

Fig. 1(a). Side-view sketch of a dish antenna mount constructed of perforated steel angle stock for window or wall mounting of a WEFAX dish.

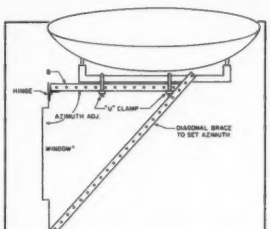

Fig. 1(b). Top view of the dish antenna mount showing the azimuth brace.

Elevation is controlled by a 1/2-inch threaded rod from the lower edge of the dish that runs up into a fitting installed on the angled member of the triangle. The fitting is a heavy-duty eye bolt with stop nuts on either side of the rod that passes through the eye. The length of threaded rod controls the elevation of the dish while the adjustable angle of the hinged triangle provides the needed azimuth adjustment. Once determined, the azimuth setting is maintained by another piece of angle stock running from the outside end of the horizontal member to another hinge mounted on the opposite side of the window frame or a few feet further along the wall—Fig. 1(b). If this piece is cut slightly longer then necessary, once initial bearings are determined you have the capability of readjusting azimuth in small increments should the spacecraft of interest be repositioned at some future point.

The mount, with antenna, is shown in Photo A. The antenna now hangs neatly on the side of the house, well away from curious hands, yet is easily accessible for adjustment, if required. A GaAs-FET preamp mounts at the feed on the rear of the dish and the signal is carried inside the house on a 20-foot length of Belden 8214 RG-8 foam coax. The converter is inside with the RG-58 i-f cable running down to the basement station site. If I were willing to invest in a 100-foot run of Heliax™ or other low-loss cable, I could probably run the signal directly to the basement, but that is not necessary in this case.

This approach to antenna mounting is a good alternative where ground-mounted antennas are out of the question due to poor look angles (trees, etc.) or where security is a problem and where roof mounting is impractical. This particular mount has been up for over two years with no problems and has withstood windstorms that have taken out local amateur and TV antenna installations.

Picture of The Month

This picture is one of a set that was provided by Jack Hawkins of San Bernadino, California. Jack, who turns out to be quite a craftsman, has spent the last six months putting together a beautifully matched set of gear including a power supply/antenna control unit, a nicely packaged Hamtronics receiver, and the WSH scan converter using the 512K CoCo 3 and my Version 4 software package on EPROM.

Jack had some very complimentary things to say about the scan converter, but modesty forbids me going into great detail. Suffice it to say that he loves it and is still amazed that it all went together with minimal hassle!

Well, that's about it for this month. Next month we are going to embark on a two-part series looking at a project that marries both scan converters and FAX into a new, integrated image display system. You are going to like this one!

New Datalink BBS Service Number

The very fine bulletin board, operated by Jeff Wallach for the benefit of a wide range of satellite enthusiasts, is going strong and providing an ever-widening database. Many weather satellite buffs have checked in and joined up since I first included the number in the January column. The number has been changed to (214) 394–7438 (however, calls to the old number are still being transferred). You will, however, want to update your communications file software.■

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Ah, a ham's life isn't easy. A DXpedition to a desert island one month, VHF contesting on a mountaintop the next. Over the years, while on the road, hams have been sunburned, frozen, bitten, scratched, mauled, scraped, crushed and, in some instances, even shot at.

Yes, indeed, an easy life it ain't. I don't know if Indiana Jones was a ham, but it wouldn't surprise me one bit. He has that look of a hard-boiled, cynical DXpeditioner. Just by looking at his face you can tell that Ol' Indy must have shouldered his way through infinite pile-ups back in the days of tubes and amplitude modulation.

Being a bit of an adventurer myself, I know it pays to plan wisely when heading out into the ham's wide world. So whenever I hit the road, I take along my ham's survival kit. I realize I'm not the only ham who carries along a goodie bag on his jaunts around the world, but I happen to believe that my kit is exceptionally well-stocked, containing just about everything necessary for any possible emergency. To wit:

☐ **Throat Spray:** This is a necessity. I mean, if you can't talk, you can't ham, right?

☐ **Liniment:** To rub on your hand. I mean, if you can't pound brass, you can't ham, right?

☐ **Money:** It's amazing the things you can still do with U.S. currency. For example, it's quite handy for bribing various overseas officials who may not quite understand what you're doing with all of that funny-looking equipment in your luggage. It's remarkable stuff. Highly recommended.

☐ **Insect Repellent:** An obvious accessory when visiting tropical places, but handy in northern climates as well—even in winter. After all, you never know what sort of a hotel you'll be staying in.

☐ **Calculator:** I don't care what sort of a math whiz you think you are, bring along a calculator. In fact, the more exotic the land you're visiting, the more you'll need it. It can be murder on the brain totaling up all those QSOs.

☐ **Portable Computer:** If you have the room, substitute a laptop computer for the calculator. The PC will help you log contacts, retrieve urgent messages from your wife and children (Daddy! Come home! We need you!) and kill the dull hours between band openings with its games. Personally, I like Toshiba's laptops, but the Tandy models are good, too. To each his own.

☐ **Mini-Flashlight:** Truly a tool with 1,001 uses. Ever try to troubleshoot a final amp in the field on a dark, rainy night? Without a mini-flashlight, the only available illumination will be your body as all those amps go flowing through it.

☐ **Swiss Army Knife:** Truly a tool with 1,000,001 uses: stripping coax, tightening antenna screws and opening stubborn beer cans are only a few of its applications. Just be sure it's a Victorinox and not one of those babies you see advertised in the Sunday newspaper supplements (they rust).

☐ **Pocket Camera:** (Or better yet, a 35mm camera.) What good is a DXpedition or contest venture without permanent documentation? I mean, who's going to believe you ever went on your little journey if you don't have photographs to prove it? How are you going to bore the guys down at the club if you don't show up with a few hundred slides? How are you ever going to get your mug in the ham magazines without a camera? Think about it!

☐ **Camcorder:** If you're into high-tech consumer electronics, bring one of these along. The VHC/C and 8mm models are the most compact and the only ones really worth fooling around with. A camcorder won't put your face in a magazine, but the tapes it generates will bore your buddies even better than your camera's slides.

☐ **Mirror:** After your boat sinks, and you're stuck on some godforsaken raft, you use this to signal for help. You know, in Morse code, the way all pro-code advocates advise.

☐ **Binoculars:** Good for spotting the rescue plane when it finally does arrive. (See? The mirror worked!)

☐ **Sunglasses:** A must in the tropics or arctic, a big help anyplace else. After all, you're going to be doing a lot of squinting at log sheets, meters, and the like, so treat your eyes with kindness. They're also helpful for covering up the effects of last night's beer blast. Good, too, for eyeing girls on the beach.

"I don't know if Indiana Jones is a ham, but he has that look of a hard-boiled, cynical DXpeditioner."

That's about it. You may have a few other items you'll want to toss in (soap, toothpaste, shaver, deodorant, etc.), but that's up to you. Many hams don't necessarily regard cleanliness as a DXpedition virtue.

I'll also leave the kit's housing up to you. I use a couple of Hartmann briefcases, but you may want to use that Antenna Specialists plastic bag you got at Dayton a few years back.

See you on the airport courtesy bus! ■

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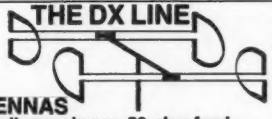

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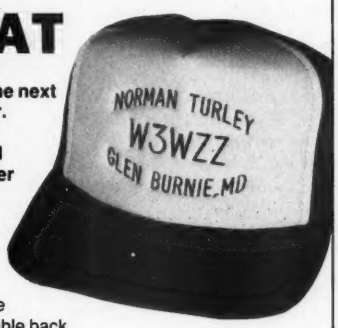

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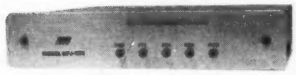

SPECIAL EVENTS

JACKSON HOLE WY
JUL 31–AUG 2

The 55th annual Wyoming, Idaho, Montana, and Utah Hamfest will be held at the Virginian Lodge, Jackson Hole, Wyoming. Talk-in will be on 146.52 MHz simplex. Tickets are $10 at the door. Contact: WIMU87 Hamfest, Inc., c/o Cheryl Ransom KA7QE, HC36-2035, Riverton WY 82501-9354; (307) 856-1811.

EAA AVIATION EXHIBITION
AUG 1–2

The Fox Cities ARC will operate W9ZL from 1300–2100Z August 1–2 in conjunction with the 35th annual EAA International Fly-In Convention and Sport Aviation Exhibition. Frequencies: 7.240 and 14.240. QSL: QSL and SASE to Ade Vanderburgt K9DHR, 264 Evergreen Dr., Kaukauna WI 54130.

CEDAR RAPIDS IA
AUG 1–2

The Cedar Valley ARC is sponsoring their Summerfest 87 at the Cedar Rapids Five Seasons Center from 8 a.m. to 5 p.m. August 1 and from 8 a.m. to 3 p.m. August 2. Talk-in on .16/.76 and .52. Features: amateur radio and computer seminars, FCC exams, commercial vendors, and a flea market. A buffet dinner will be held Saturday night. Fees: tables $10; commercial $20 per booth, $15 each thereafter. Admission: adult $5 advance, $6 at door; student $3 advance, $4 at door; 12 and under free. Banquet: $10 advance, $13 at door (if available). Contact: Summerfest 87, 2825 23rd Ave., Marion IA 52302; (319) 377-2761 or (319) 362-3602.

TWINS DAY CELEBRATION
AUG 1–2

The Cuyahoga ARC will operate K8ZFR and member stations at the annual Twins Day Celebration from 1700–0100Z August 1 and from 1700–2000Z August 2. Frequencies ± 20 kHz. Phone: 3.870, 7.245, 14.245, 21.320, 28.440; CW: 3.800, 7.050, 14.050, 21.050; Novice: 15, 40, 80 meters. Special QSL: QSL and SASE to C.A.R.S. Twins Day, P.O. Box 357, Twinsburg OH 44087.

ANGOLA IN
AUG 2

The Steuben County ARC presents the 28th annual FM picnic and hamfest 2 August at Crooked Lake. Talk-in on 146.52 and 147.81/.21. Features: picnic-style BBQ chicken, exhibitors, and vendors. Admission $2.50.

BERRYVILLE VA
AUG 2

The Shenandoah Valley ARC will sponsor the 37th Annual Winchester Hamfest on August 2, from 7 a.m. to 3 p.m. at the Clarke County Puritan Fairgrounds, Route 7, two miles west of Berryville, Virginia. Talk-in on 146.22/.82 or .52. Fees: admission $4, children under 12 and wives free; tailgating and limited tables, $5. VE exams at 9 a.m. (limited walk-ins—must register by 8:30 a.m.). Contact: Rob Kinsley NT4S, (703)-869-5113; or SVARC, PO Box 139, Winchester VA 22601.

COLUMBIA TN
AUG 2

The Maury ARC is sponsoring its first indoor annual hamfest 8 a.m. to 4 p.m. at American Legion Post 19, New Nashville Highway, Columbia TN. Talk-in on 147.72/.12. Refreshments. VE license exams. Fees: admission $2; tables $5. Contact: George Russell WB4JCR, Box 832, Columbia TN 38402; (613) 388-0577.

FISHERS ISLAND SOUND NY
AUG 2

The Tri-City ARC will mount its fourth annual expedition to Flat Hammock Island in Long Island Sound on Sunday, 2 August. KA1BB will operate from 1300–2000Z in the lower 20 kHz phone and CW 40, 20, and 15 meter bands and (hopefully) the center of the 40 meter Novice band. QSL: Tri-City ARC, P.O. Box 686, Groton CT 06340. Contact: Bob Darfel KA1BB, 8 Willow Lane, East Lyme CT 06333; (203) 739-8016 or (203) 446-7325.

VALPARAISO IN
AUG 2

The Porter County ARC presents the Northwest Indiana Hamfest and Computer Fair Sunday, August 2 at the 49'er Drive-In Theater, Route 9, north of Valparasio, Indiana. Talk-in on 146.775/.175 MHz and 145.45/144.950. Gates open at 7 a.m.; 6 a.m. for vendors. Admission: $3.50 per person (under 12 free). Contact: Rich Stahl K9LBO, P.O. Box 1782, Valparasio IN 46383.

WEST MIFFLIN PA
AUG 2

The 50th Golden Hamfest of the South Hills Brass Pounders and Modulators ARC of Pittsburgh PA will be held on August 2 on the south campus of Community College of Allegheny County in West Mifflin PA. Talk-in on 146.13/.73 or 146.52. Special-event station frequencies to be announced. Contact: Doug Wilson WA2ZNP, 185 Orchard Avenue, Emsworth PA 15202.

CANTON OH
AUG 3–7 and AUG 8–9

The Canton ARC will operate special event station W8AL to celebrate the Pro-Football Hall of Fame Greatest Weekend August 3–7, 2200–0200 UTC and August 8–9, 1700–2300 UTC. Frequencies: SSB 7.270 14.270; CW 7.060 14.060. RTTY and Novice operation possible. Unfolded certificate: QSL and 9x12 SASE with 2 units of first class postage; folded certificate: QSL and SASE #10 to Randy Phelps KD6JN, 1226 Delverne Ave., SW, Canton OH 44710.

AUSTIN TX
AUG 7–9

The Austin ARC and the Austin Repeater Organization are sponsoring the Austin Summerfest August 7–9 at the Villa Capri Motor Hotel, 2400 North Interstate 35. The event hosts the summer meeting of the Texas VHF-FM and is also the ARRL West Gulf Convention. Features: flea market, dealer exhibits, ARRL forum, technical program, transmitter hunt, VE exams for all classes, barbeque, and Wouff Hong ceremony. Fees: pre-registration $5, $7 at door, under 15 free. Barbecue: $9 (requires pre-registration). Swapfest tables: $5 each (limit three). Contact: Joe Makeever (512) 345-0800.

INDIANAPOLIS IN
AUG 7–23

Station W9PAX (W9 Pan American Ten) will be operational during the Tenth Pan-American Games being held in Indianapolis August 7–23. The special event station will begin operation on an unscheduled basis during May, and will be operational from 0001 UTC, August 1 to 2359 UTC, August 23. Operation: 30 kHz up from the bottom of each band, 1.8–28 MHz for CW. SSB around 1.850, 3.850, 7.250, 14.250, 21.350, and 28.550. QSL: QSL and SASE to W9PAX, Box 18495, Indianapolis IN 46218-0495 USA. Certificate: for working W9PAX on three different bands; working W9PAX once and one station from any three of the participating Pan-American nations; or working W9PAX once and three Indiana stations. Certificate: QSL, SASE, list of contacts, call, date, and time to same address. Contact: Cornelius M. Head WB9ZQE, 9046 Mercury Dr., Indianapolis IN 46229; (317) 263-5281 or (317) 898-2792.

AMARILLO TX
AUG 8–9

The Panhandle ARC's 13th Annual Golden Spread Hamfest will be held at the Quality Inn of Amarillo, 601 Amarillo Blvd. West beginning at 9 a.m. both Saturday and Sunday. Fees: pre-registration $5, at door $6; tables $5 each. Features: VE testing, commercial distributors, dealers, and flea market. Contact: PARC Hamfest, Box 10221, Amarillo TX 79116.

ESSEX JUNCTION VT
AUG 8–9

The Burlington ARC will hold its annual hamfest on August 8–9, all day both days, at the Champlain Valley Fairgrounds in Essex Junction VT. Talk-in on 146.34/.94. Fees: admission $4 U.S. or $5 Canadian, under 12 free. Contact: Barb Kimball N1DLE, 1 Sundown Dr., Williston VT 05495; (802)-878-5555.

GLENWOOD SPRINGS CO
AUG 8

Ski Country ARC will host its 6th Annual Hamfest in conjunction with the Colorado Council of ARC summer meeting at the CMC Building, 1402 Blake Avenue from 9 a.m. to 3 p.m. Talk-in 146.07./67. Free admission. Fees: tables $5. VE exams 9 a.m. Features: videotapes, packet and AMSAT demos, HF station on air. Contact: Bob Ludtke K9MWM, 406 Yale Circle, Glenwood Springs CO 81601; (303) 945-8722.

FLEURIMONT QUEBEC
AUG 9

Fleurimont, Quebec celebrates its 50th anniversary. Station VE2FMA will operate August 9 1400–0200 UTC on bands 14.155 and 3.765 MHz ± QRM. Certificate: before September 9; SWLs welcome. Certificate Information, VE2FQX, 1866 ch. Galvin Fleurimont, Quebec, Canada J1G 3G1.

GEORGETOWN KY
AUG 9

The Bluegrass ARS is sponsoring the Central Kentucky ARRL Hamfest Sunday, August 9 from 8 a.m. to 4 p.m. at Scott County High School, Longlick and U.S. Route 25 in Georgetown. Talk-in on 146.16/.76 repeater. Features: technical forums, license exams, commercial exhibits, and flea market. Fees: $5 in advance, $6 at gate. Contact: Bill DeVore N4DIT, 112 Brigadoon Parkway, Lexington KY 40503.

IN
AUG 9

The 8th annual Grant County ARC hamfest will be held at the 4-H Fairgrounds, Sunday, August 9 beginning at 8 a.m. Fees: $3 advance, $4 at gate. Tables: $4 inside, $2 fleamarket. Contact: SASE to Brooks Clark WB9EAP, 2202 South Boots St., Marion IN 46953.

ST. CLOUD MN
AUG 9

The St. Cloud ARC Hamfest is being held August 9 at the Whitney Senior Citizens Center. Talk-in on .34/.94 primary, .615/.015 secondary. Fees: $3 first ticket, $2 additional tickets. Contact: SCARC, Box 141, St. Cloud MN 56302.

WARRINGTON PA
AUG 9

The Mid-Atlantic ARC is holding its annual hamfest from 8 a.m. to 3 p.m. at the Bucks County Drive-In, Route 611, Warrington. Talk-in WB3JOE/R, 147.66/.06 or 146.52. Fees: $3 admission, $2 each tailgate space. Contact: John Bartholomew WB3ELA, MARC, 203 Second Ave., Broomall PA 19008; (215) 356-7197.

WILLOW SPRINGS IL
AUG 9

The Hamfesters Radio Club is holding its 53rd annual hamfest at Sante Fe Park (91st and Wolf Rd.). Features: vendors, ARRL and FCC tables, refreshments. Fees: $3 in advance, $4 at gate. For tickets: check and SASE to John Schipitsch W9BNR, 13058 Finch Ct., Lockport IL 60441. General information: (312) 403-1043.

AKRON OH
AUG 10–15

Special events station W8VPV will be operated at the All-American Soap Box Derby by the Cuyahoga Falls ARC Monday–Friday, 2200–0300Z and Saturday, 1100–2000Z. Frequencies: 3.860, 7.230, 14.240, and 28.420. Certificate: Large SASE to W8VPV, P.O. Box 614, Cuyahoga Falls OH 44222.

SPANISH FORK UT
AUG 12–15

Constitutional Commemorative Rendezvous Encampment. The Utah County ARES and the Utah National Parks Council will be operating station K2BSA/7 from 1800Z, August 12 to 0600Z, August 15. Frequencies: CW: 7.040, 7.125, 14.040, 21.040, and 21.140; phone: 7.245, 14.270, and 21.310. Commemorative QSL: SASE to NR7P, 376 North 520 West, American Fork UT 84003.

GREEN BAY WI
AUG 15

The Green Bay Mike and Key Club's Summer Swapfest is being held at the Community Service Center, 1673 Dousman St. beginning at 7 a.m. (sellers 6 a.m.). Talk-in on 147.72/.12 and 147.96/.36. Fee: $1 admission. Features: electronic equipment, components for hams, computer hobbyists and experimenters, oldtime radio, and more. Tables: (by reservations only) $5; send SASE with name, call, address, and check to: Green Bay Mike & Key Club, c/o Cathy Strommen KD9WO, 1500 Main St., Green Bay WI 54302. Testing: pre-register by July 15, walk-ins accepted (must have original license and photo I.D.); Contact: Larry Siebers KD9IA, 7077 Weyers Rd., Freedom WI 54130; (414) 788-3823.

POMONA CA
AUG 15

The Tri-County ARA 1987 Hamfest will be held on August 15, from 7 a.m. to 3 p.m. at Palomares Park at Arrow Highway, in Pomona. Fees: tables non-members $5, members $2. FCC exams given by Frank Westphal KF6E. Contact: Eugene Hoelzle K6PMC, 1071 Vanderbilt, Claremont CA 91711; (714)-624-6382.

RHINELANDER WI
AUG 15

The Northwoods ARC/ARES is sponsoring the 1987 Swapfest at South Park School beginning at 9 a.m. Talk-in on 146.34/.94. Fees: $1 admission. Contact: Len Bauman K9RMN, 1312 Dorothy St., Rhinelander WI 54501; (715) 369-3296.

HUNTSVILLE AL
AUG 15–16

The Huntsville Hamfest and the ARRL Alabama State Convention will be held at the Von Braun Civic Center, 700 Monroe St. from 9 a.m. to 5 p.m. August 15 and 9 a.m. to 3 p.m. August 16. Talk-in on .34/.94. Fees: free admission, parking $2, amateur exams $4 (bring copy of license, identification with photo). Contact: Gwin Givens (205) 883-2760 or Don Tunstill (205) 536-3904.

PIPERSVILLE PA
AUG 15–16

The South Jersey Radio Association K2AA will operate from 1400Z August 15 to 2100Z August 16 to help commemorate the 75th Anniversary of the Sea Scouting Program of the Boy Scouts of America. Frequencies: Low end of 75, 40, 20, and 15 meter general phone bands and 10 meter Novice band. QSL: SASE to SJRA, P.O. Box 1026, Haddonfield NJ 08033.

GEORGETOWN DE
AUG 16

The 3rd Annual Delmarva Hamfest will be held at Delaware Community College, Del 18 from 8 a.m. to 4 p.m. Talk-in 147.075. Exams offered. Fees: inside tables $5; tailgate space $3. Contact: Delmarva Hamfest, Route 2, Box 244G, Georgetown DE 19947.

LAFAYETTE IN
AUG 16

The Lafayette Hamfest will be held at the Tippecanoe County Fairgrounds, opening at 5 a.m. Indoor set up 5–8:30 p.m. Saturday, August 15. Contact: Michael Collison KA9IHB, 111 South 7th St., Lafayette IN 47901-1628.

RICHMOND CA
AUG 16

The East Bay ARC will commemorate its 40th anniversary and annual picnic operating W6CUS 1900–2300Z August 16. Frequencies: SSB 7.290, 14.430; CW 7.125, 14.065 MHz. W6CUS-1 triple port connections will be accepted from 1500–18:00Z on 7.093, 144.97, and 223.58 MHz. Commemorative Certificate: QSL and SASE to EBARC, Inc., P.O. Box 1393, El Cerrito CA 94530 by October 16. ■

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QRP AND TEN-TEC

Last month we talked about the Heath series of QRP radios. This month we'll take a close look at Ten-Tec, a company which some people call "The Cadillac of QRP."

Ten-Tec was founded in 1968 by Albert Kahn K4FW and Jack Burchfield K4KU. The first products they sold were small electronic modules for the home builder. Those modules were so successful that Ten-Tec built up a small, low-powered transceiver called the PM2. The PM stood for "Power Mite." The PM2A and PM3 followed, each one better that the first. As with most equipment building, model changes brought on new ideas. The Power Mites were very simple. They had direct-conversion receivers and sported about 2 Watts of output. Most covered the 80- and 40-meter bands while different models covered the 40-, 20-, and 15-meter bands. Dial calibration was especially crude. You knew you were on the 40-meter band—somewhere.

Not long after the PM-series transceivers were on the market, Ten-Tec introduced the Argonaut. The first model, the Argonaut 505, was an instant hit with low-power operators. The 505 was the first low-powered transceiver that offered SSB. For the CW operator, the Argonaut's QSK, or full break-in operation, would become the standard for the entire industry to follow. The Argonaut's small size and weight allowed the unit to be portable. With the diet-like demand for power the Argonaut 505 could operate for days on end with just two six-volt lantern batteries.

The 505 had some bugs, however. The lack of reverse-polarity protection led to so many rigs being smoked that Ten-Tec packaged up a complete kit to replace cooked components. For some strange reason, Ten-Tec decided to place the drive/gain control on the rear panel. This proved a rather unpopular spot for a much-used control. The ten-meter band was all lumped together on one spread. Tuning on ten was a real chore.

On the used market, a good, clean Argonaut 505 should go for about $100–$180 depending on accessories. The crystal calibrator and the outboard audio filter should be considered in the selling price.

Most of these problems were solved with the introduction of the Argonaut 509. The 509 has become the de facto standard of QRP transceivers. With the drive control located on the front panel and the reverse-polarity protection built into the transceiver, all seemed right with the world. The 509 has a better receiver than the 505 and sports a different power amplifier. Many a Field Day has seen an 509 under the tent.

On today's used market price, look to fork out anywhere from $120–$200. Again, this depends on the condition of the unit and its accessories.

It would seem hard to improve on the 509, but Ten-Tec did just that with the Argonaut 515. I like to think the 515 was built out of left-over Triton 4 parts. There was a second improvement in receiver design. The transmitter was changed once more. Finally, the entire ten-meter band was spread out over four different bands. Gone with the 515 was the familiar eggshell-white color case. The newer bronze color replaced the old standby. The CW filter, while still outboard, had evolved into a notch filter and audio filter in one unit. The small tuning dial was replaced with a larger one for a better feel. Ten-Tec made only about 800 of these units. As a result, the price for a used 515, if you can find one, can be quite high. Plan to spend a long time looking in the flea markets. You may have to lay down up to $200–$350 for one.

While the 509 was still in production, Ten-Tec was able to place into the market a 100-Watt solid-state amplifier, the model 405. This was a matching amplifier for the Argonaut. It would take the 2-Watt input and dump out 50 Watts to the antenna. While we don't think much of this today, this was quite something 11 years ago. With the FCC ban on ten-meter amplifiers, Ten-Tec was forced to remove the 405 from the market. Consequently, a used 405 can cost almost as much now as it did when the unit was new. I have seen the model 405 go for $150.

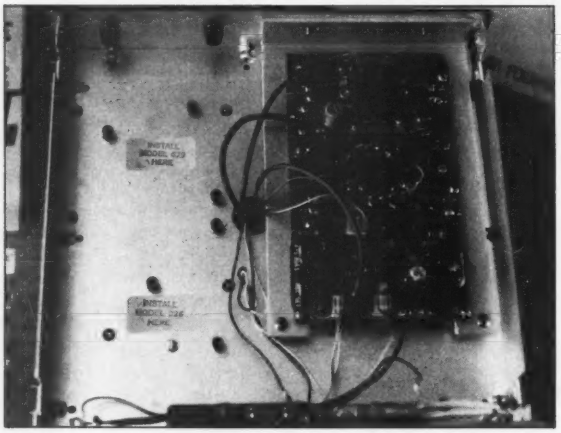

Photo A. Inside the Century 22. All that open space is for crystal calibrator and keyer options.

With the Argonaut 515 discontinued, one would think that would be the end of the story. Ten-Tec was busy all this time, however, building a transceiver called the Century 21. This radio was designed for the newcomer to ham radio. With several advanced features, the radio soon found its way into the shacks of dedicated CW ops. The Century 21 was a rather large radio. Large easy-to-use knobs for the controls along with an open panel layout made operation exceptionally easy. The Century 21 came with its own built-in power supply. As the unit came from the factory, you could not connect up an external 12-volt supply. There is a simple fix for this problem, and many a 21 has seen duty during Field Day.

The Century 21 uses a double direct-conversion receiver. The solid-state power amplifier will produce about 45 Watts of output. The Century 21 actually came in two different models. One model had an analog dial, while a different production run came with a digital dial. The digital readout version upped the price about $100.

Although the Century 21 is no longer in production, the resale price for the radios are still quite high. Plan to spend about $125–$150 for the analog version and up to $200 for the digital version.

Still believing in a market for small, medium-power transceivers (yes, there really is!), Ten-Tec introduced the Century 22. Like its bigger brother, the 22 sports a double direct-conversion receiver. The transmitter is again all solid-state but with only about 35 Watts of output. The case style is much smaller and looks very similar to the Argosy. The 30-meter band has also been added. The Century 22 only comes in a analog dial. As can be seen in the photograph, the inside of the Century 22 is wide open. This is a real treat for those in the service department. The top of the case holds the broadbanded transmitter power amplifier. The rest of the circuits are on the bottom half. The extra room on the top side is for the crystal calibrator and the keyer module, both of which are options. The Century 22 requires a external power supply which is capable of six Amperes.

Since the Century 22 is still being produced, check your local dealer for the best price. Flea market prices will show about $250–$300 for the radio.

What about taking all the features of the 505, 509, and the 515, throw in the 100-Watt amplifier, add crystal filters, and package the whole unit up into a modern case? Well, that is just what Ten-Tec did and what they came up with is called the Argosy. To me, this is a QRP operator's radio. The Argosy will run 100 Watts input, but, at the flip of a switch, power is reduced to 5 Watts. Gone are the direct-conversion receivers of the Century 21 and 22. With user-installed crystal filters, you can wiggle up close to the kW boys on 20 and not get blasted away. The small size makes portable operation a breeze.

The Argosy came out first with a analog dial. After many a re-

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quest, Ten-Tec updated the unit to include a digital readout. In doing so, the receiver board was changed and the ALC now operates in the QRP position, something the original Argosy did not do. QSK operation continues in the Argosy, as does the superior audio, another Ten-Tec claim of fame. CW and SSB modes are available. The Argosy requires 9 Amps of current at 12 volts for operation. Install the noise blanker, plug the Argosy into the cigar lighter of the car, and go mobile. The Argosy is without a doubt going to replace the Argonaut as the mainstay in QRP operation.

While the Argosy does not cover all the WARC bands, it does include 30 meters. Ten meters has been spread out in four bands, so tuning around on ten looking for band openings will be much easier.

There are only several complaints against the Argosy. The #1 complaint is the lack of rf-gain control. The second is price. A new base-model Argosy is $695. Ten-Tec had dropped the Argosy from their line of transceivers, but brought it back by popular demand. The older Argosy with the analog dial can be purchased for about $350 on today's used gear market. The newer Argosy II, if found, can bring close to $450–$550, depending on filters and accessories.

From the PM series to the Argosy. There has never been a company more dedicated to the enjoyment of ham radio than Ten-Tec. Aside from the QRP transceivers, the Triton 1, 2, and 4 helped launch the industry into the age of solid-state power amplifiers. Soon to follow were the Omni series, Corsair, and the new Paragon. To all this and even more, add a warranty that makes the rest of the industry green with envy! No wonder Ten-Tec has earned the right to be called, "The Cadillac of QRP."

This completes my look at some of the companies that got in on the ground floor of QRP equipment. There are, of course, different companies that made and sold low-powered radios, among these Kenwood, ICOM, and Yaesu. Let us not forget also the many thousands of home-brew transmitters, receivers, and transceivers.

On the topic of home-brewing, the letters received in last month's column from the 6L6 special shows me you guys like to build. Well, before I forget, the schematic for the 6L6 Special was done for me by Stew Bracken KA8CZA. Stew did the drawing using Prodesign running on a Tandy 1200HD. A lot of people wrote and asked me about the CAD, so now everyone knows. Stew will be doing most of the schematics for me in this column.

Do you have a special project that you are building? If so, why not send it along with the schematics and other notes to be shared here in the QRP column? Write up your project and send it to me and I'll do my best to get it printed up here in the QRP column.

Whats coming up next? I haven't the foggiest! Summer weather is here and the bike is ready to roll. I'll clip on the HT and head out for the open road, bicycle mobile. So I guess you can say, until next month, "I'm gone with the Schwinn." ■

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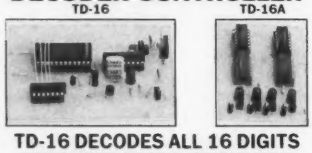
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73 INTERNATIONAL

NOTES FROM FN42

August is a red letter month, with seven National Days and eight Independence Days: National Holidays on the 1st for Switzerland, 2nd for El Salvador, 4th for Jamaica; Singapore has one on the 9th, the Congo and Korea both on the 15th, Morocco on the 20th, and Malaysia on the 31st. For Independence Day, Niger the 3rd, Bolivia, 6th; Ecuador, 10th; Chad, 11th; Pakistan, 14th; Indonesia, 17th; Afghanistan, 19th, and Uruguay, the 25th. It is Memorial Day in Cyprus on the 3rd and Freedom Day in Guyana on the 4th; the Queen has a birthday in Thailand on the 12th and it is Woman's Day in Tunisia on the 13th (which is on a Thursday). Four more days celebrating events of national pride are on the 20th, 24th, 27th and 29th, when it is, respectively, Constitution Day in Hungary, National Flag Day in Liberia, Liberation Day in Hong Kong, and Heroes Day in the Philippines.

ROUNDUP

Israel/Jordan. It will not be true for too much longer, one hopes, but for now, ham radio transmissions between these nations is forbidden. However, JY and 4X had a nice chat a couple of months ago.[*See Ron Gang's report from Israel, below: the kind of news which makes magazine sections like this one very satisfying to edit.—Ed.*]

Columbia. The Center of Emergency Communications—Centro de Comunicaciones de Emergencia (CCE)—of the Emergency Operations Committee of the Red Cross of Columbia at Ibague, Columbia, will be grateful to receive "any written material, maps, flow charts, photographs or catalogs that might serve as learning materials" for forums and seminars on emergency communications (emphasis on radiocommunications) in disaster and emergency situations.

The Center was created following the Nevada del Ruiz volcano which wiped out the town of Armero, in the Ibague district. The CCE will be a permanent function sponsored by all agencies, governmental and private, which have roles to play in emergency situations.

If you have anything you think would help, send it to Jesus Antonio Rivera Santos, Coordinador del C.C.E., PO Box 1298, Ibague, Columbia, South America.

Australia. A letter from Jim VK3YJ with his next column (which will have to wait for space in a future issue) speaks appreciatively of an editor's note in the March issue (at the end of the New Zealand column) reminding readers to (at least) send IRCs when requesting information from another ham. "I could just about write a book on the pitfalls of being a columnist to a worldwide publication" he says, and explains that one of the biggest is his frustration when faced with requests which involve expenses.

Both reasonable and some amazingly unreasonable requests for information and/or materials arrive with no contributions for postage or expenses, and much as he would like to respond, he simply can't afford to. *Please remember to pay your way! Don't, please, make our international contributors sorry they had their names and addresses published here!*

Nauru. This eight-square-mile, 8,000-population Republic in the West-Central Pacific Ocean may make a contribution to this column in a future issue. We have heard from Eddie DeYoung C21XX, Director of Telecommunications, who tells us the island has a dozen hams. Nauru has a fascinating history, one of the highest per-capita incomes in the world, and an uncertain future since the island is slowly disappearing.

Ireland. This being a packet-radio issue it is appropriate to quote from the May *I.R.T.S. Newsletter* (Radio Transmitters Society). It reports on the availability of public-domain software, DIGICOM 64, "an AX25 programme for the Commodore 64 micro." The Society seems to be doing a good job helping its members; it offers a translation from German of the instructions for the program and a copy (if a blank disk is provided) to anyone who has a C-64 with disk drive. And more: comments on the modem design suggested. It uses "a relatively expensive chip—the AMD 7910—but it is very simple in concept and the circuit includes an opto isolater to protect the C-64 from damage. Other than a few op.amps providing some filtering/buffering there is little else of note in the circuit and it is suitable for Vero-Board type construction." A remark many hams can identify with: "...users of the various homebrew TNCs are finding the learning process slow and a little painful."

Grand Cayman. Eden ZF1EJ and Jamie ZF1JC are the new president and QSL manager, respectively, for the Cayman Amateur Radio Society (PO Box 1029, Grand Cayman, B.W.I.) *** Pirates Week will be October 24–31, and ZF1ØPW has been issued for use by CARS members. It will be used on a multi-operator basis on all authorized bands and for all modes. The special QSL card is available for any contact made—send US$1.00 with a QSL card before January 1, 1988. *** ZF1MM (VE5RA) and ZF9SV (VE7SV) have advised the Club that they do not want the 500 or so QSL cards being held for them following the visit. There will be many disappointed hams. *** The use of 160 meters continues to be permitted *on a restricted basis only*. Visiting hams, and contesters particularly, take note. Permissable frequencies are 1.800–1.825, 1.875–1.925, and 1.975–2.000 MHz.

Finland. Last month, we reported the toll-free number (1–800–221–9539) available in the US (except Connecticut) to call Radio Finland. It has been so popular that another, NOT toll-free number has been opened: 1–203–688–5540. (*Radio Sweden International*, Bulletin 1934)

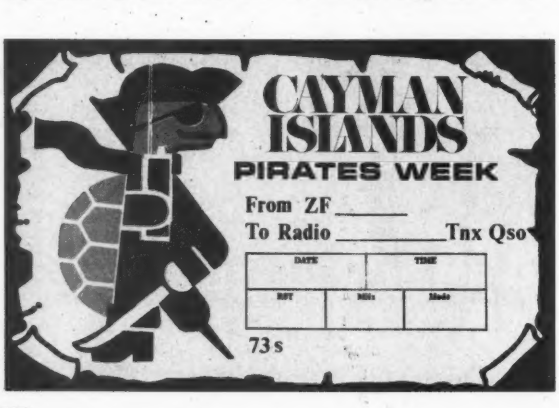
China. Sil Marini WPE4IIO, who has a BY1PK QSL card, writes: "For those not yet fortunate to know...BY8AC (Yang) has the most beautiful QSL thus far—Fantastic color photograph of 'The Bathing Caves', *gold leaf* CSRA symbol, BY8AC, Chinese characters....Gosh! Mine came today!"

PEOPLE'S REPUBLIC OF CHINA

Chang Han Dong (BY4AOM)
Institute of Estuarine & Coastal Research
East China Normal University
Shanghai 200062
China

Amateur Radio on the Roof of the World—BTØNMN on Mount Namunani. At four past twelve o'clock, May 26, 1985, the China-Japan Mount Namunani (Mt. NMN) United Mountaineering Expedition's eight members reached their goal in one fell swoop. The Chinese news agency, Hsinhua, and Japan's newspaper, *Mainichi*, released the news in Peking and Tokyo, respectively, at fifteen o'clock the same day. The Minister in charge of the state physical culture, Honorary Vice Chief of the mountaineering expedition, Li MenHua, came to the amateur station BY1PK personally and listened to the report from Shi ZanChun, Chief of the mountaineering party, from BTØNMN. BY1PK and the Minister sent congratulations.

Mt. NMN is situated in the western part of the Himalayas in Tibet, with an elevation of 7,694 meters; it was a virgin mountain. The advance party and BTØNMN had set



out on April 13 and had an eight-day march, over the KunLun Mountains and through the valley between the GangDis and the Himalays. They then set up the base camp on a gentle slope northwest of NMN, at an elevation of 4700 meters.

The communications equipment consisted of a transceiver running 100 Watts, a power supply for special use, an AC-102 antenna coupler, and a 3-element yagi which could be raised to 9.5 meters on a metalline mast. The latter were bolt construction for easy assembly.

The station was to have been set up on April 23, but that day it was blowing harder and harder. The yagi was light but large in size (the driven element is over 8 meters, the tower mast 6 meters), so they had to put the antenna into the tent and wait for the next day. This dawned bitterly cold; the temperature hovered around 10 degrees below zero centigrade, but the team braved it and carefully assembled the antenna. What a magnificent antenna! It was standing like a giant in the Himalays—the first modern mark was made in the world of untrodden snow and ice!

In the tent there was a small desk and the transceiver was on it. Antenna direction: northeastern; frequency: 14.333 MHz; S-meter: good; swr: 1.5 below; power meter: 100 Watts. OK! Calling CQ. No answer. Oh... had passed the appointed time and had to wait until the next scheduled time. At ten to three in the afternoon, the operator worked in CW.

CQ, CQ, CQ.

BTØNMN calling. Standing by.

BTØNMN this is BYØAA returning. Your signal is 599, very good. Please go to SSB. BYØAA in XingJiang.

At this time BY1PK came on the air, and all the members were very happy. The advance party leader of the China Mountaineering Expedition, Shang ZiPing reported to Peking on the campsite setup. From then on there were a large number of climbing reports sent to Peking and an uninterrupted flow of instructions from Peking to the base camp.

May 26 was the climbing day for the peak. UHF rigs were worked beginning at 6 a.m. The base camp tent became the command post, with commands sent to the "shock brigades" of each campsite. Many reports involved weather, the progress of the climb, the drain on members' strength and on supplies. Reports went to Peking by HF. At a quarter to twelve the climbers reported to the base camp: "We have reached the peak. The top is very narrow, only holding two people, and there is much wind now."

Mountain party chief Shi ZanChun replied and ordered: "You must make the best use of your time and then withdraw at once."

So it was that at four past twelve the last two members of the party, who had been videotaping, reached the peak. And at 13:00 word reached Peking that the China-Japan 8-member team had reached the top of Mt. NMN for the first time.

During the expedition BTØNMN worked many foreign stations on 20 and 15 meters—about one thousand, with 30% of then being Japanese. Other nations included West Germany, France, Russia, Italy, Holland, Belgium, and Finland. The pileups were very very big at times, so it was very difficult, and hams who worked BTØNMN will prize their QSL cards.

BTØNMN glitters like a bright pearl in the history of Chinese amateur radio.

(Chang Han Dong writes, "I have received many letters from the U.S.A. from those who read my report and my letter. They are very friendly, so many thanks!"—Ed.)

ANDAMAN AND NICOBAR ISLANDS TEAMS

Team One—2/16–3/2. Andaman: Misses Bharathi VU2RBI and M. Bhanumathi VU2BL, Mrs. Rama VU2MYL, Messrs. Suri VU2MY, Nagarajan VU2KNN, and Saheb VU2SUS. **Nicobar:** Mr. Saheb, Miss Bhanumathi.

Team Two—3/3–3/18. Andaman: Miss Bharathi, Messrs. Jose Jacob VU2JOS, Subrahmanium VU2VSN, P.M. Subrahmaniam VU2SU, Upadhyaya VU2NUD. **Nicobar:** Messrs. Saheb, P.M. Subrahamaniam, Upadhyaya.

Team Three—3/15–3/27. Andaman: Miss Bharathi, Messrs. Ram VU2BQZ, Venkat VU2RAT, Kanth VU2LKP, Singh VU2DS, Suri VU2MY. **Nicobar:** Messrs. Singh, P.M. Subrahamaniam, Saheb, Suri.

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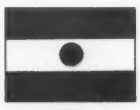
AT ANDAMAN NICOBAR ISLANDS FROM
TEAM LEADER R. BHARATHI VU2
SL-NO NAME OF THE ISLAND
ANDAMAN
NICOBAR

Activity on the Andaman/Nicobar DXpedition. (No identifications with the photo, but the only two names readable on the board are those of Director S. Suri VU2MY and Team Leader Miss R. Bharathi VU2RBI.) Note the graceful hands holding up the N.I.A.R logo.



INDIA

Mr. S. Suri VU2MY, Director
National Institute of Amateur Radio
5–B, P.S. Nagar
Hyderabad - 500 457
India

DXPEDITION TO THE ANDAMANS & NICOBARS

This material barely survived the mails and it is likely that not all of it reached us. Parts were too damaged to read and a few editorial guesses have been made.—Ed.

The ham members of the National Institute of Amateur Radio have very successfully conducted a DXpedition to the Andaman and Nicobar Islands and returned to the mainland on 1st April 1987. (See box.) Stations were set up in Port Blair [South Andaman Island] and on Car Nicobar w.e.f. 20th February to 31st March. The Car Nicobar station was operated exclusively on Morse code, CW. The achievements were:

- Over 30,000 contacts in 191 countries.
- Records established by the team leader, Miss R. Bharathi VU2RBI (14,450 contacts in 182 countries) and the trio of Messrs. Subrahmaniam VU2SU [or VU2VSN?] Saheb VU2SUS and Jose Jacob VU2JOS (8,000 contacts in Morse).
- Three expedition operators will get the DXCC award as a result of the 40 days of operation; it is estimated that 2,000 hams reached the DXCC level with these VU7 contacts.
- Preliminary counts indicate that the Japanese made the most contacts (10,000), followed by the USA (4,000) and USSR (3,000).
- There was an air-mobile contact (OK3WN) and several maritime-mobile contacts.
- Prime Minister Shri Rajiv Gandhi VU2RG wrote appreciation.

Lt. Gov. Lt. Gen. Oberai (Ret.) from Port Blair and Deputy Commissioner of the Nicobars Mr. Selvaraj IAS both opened the DXpedition programme and gave a farewell party. During the operation there were demonstrations and exhibitions, including one for the Nicobari Tribal students, a part of which was a programme for introducing them to the field of ham radio. Both the Lt. Governor and Deputy Commissioner feel that the development of ham radio would lead to a valuable supplementary communications resource for the islands.

DXpedition volunteers included three women, five students, a scientist, a disabled person and an aged (over 60) person. Hams from the US, Japan, and West Germany visited during operations.

There were operations on 160, 80, 40, 20, 15, and 10 metres, with only four contacts made on 160. Out of the 30,450 contacts, only one ham, Mike LZ2DF from Bulgaria was able to establish contacts on all bands; he did so with VU2RBI.

N.I.A.R. AND THE FUTURE

Activities are planned in the areas of relief communications, medical traffic, nets, daily weather reporting, and the covering of and participation in sports events (car rallies, for example). Also: fox hunting, involving children with simple receivers and simple instructions, compass, area maps, etc., in what will be organized as a physical running sport in the forest, adventure, and radio-skills learning, adding up to a constructive nation-building activity.

These activities will need a lot of support from the government and philanthropic organizations. We want to enter into a new century by taking and opening opportunities as much as possible; we must keep up with the world, and do so through our own efforts.

N.I.A.R also has plans to organize a major international ham conference in Hyderabad in February next year, and wants to participate in the 4th world amateur radio direction-finding championship in Czechoslovakia in September, by entering 20 participants from all over India. This can be possible if the governments of India and the state of Andhra Pradeshsh and others come forward to provide the support which will be necessary.

On the top of the water tower at 940 meters. Lorens 5B4SA (R) is checking out the repeaters he can access with his hand-held. Amir 4X6TT on the left.

Operating positions at 4X9B (Bethlehem). Note electric heaters; it was cold there! L to R, 4X6TT, 5B4SA, and 4X6DX.

ISRAEL

Ron Gang 4Z4MK
Kibbutz Urim
Negev M. P. O. 85530
Israel

EASTER IN THE HOLYLAND

Last year I reported on the Holon-Bat Yam Radio Club's week-long operation from the old City of Jerusalem, using 4X5J. [See *73* International, October, 1986.] This year they really outdid themselves, operating during the week of April 14–21 with stations operating *simultaneously* from five different locations of Biblical significance.

From Bethlehem, with antennas on a high water tower 916 meters above sea level, 4X9B tallied 15,000 QSOs. Operating three separate transceivers on different bands, the hardy crew contacted more than 150 countries.

Jerusalem was not neglected, with 4X2J operating from the same location in King David's Citadel that last year housed 4X5J. They made about 10,000 QSOs.

The peak of Mt. Tabor was crowned by a triband yagi and a station housed in a tent running off battery power. Here, 4X7T made close to 5,000 contacts under field-day-type conditions. Help from the nearby kibbutzim (collective farming villages) came in the form of food, accomodations, and the charging of the lead-acid batteries used. The kibbitzim Bet Keshet and Giv'at Oz, homes of the club stations 4Z4SL and 4Z4SQ.

4X3N, making 6,000 QSOs, put Nazareth on the map. 4X8S, at Stelle Maris on Mt. Carmel, was especially hot on CW, and completed the list of the five stations with never-before-used prefixes. Many of the operators were visitors from abroad who took up the invitation to take part in the operation as they were invited to do by way of the international amateur radio press. [See *73* International for November, 1986.]

One of the highlights of the operation made front-page news in the national papers. King Hussein JY1 of our neighboring country, Jordan, was in England at the time and was visiting an English amateur. Two of the above stations had their operators nearly fall off their chairs when Hussein called them. The King not only made the QSOs with them (59 both ways, of course!) but also wished the operators a happy Passover Holiday.

For those of you who may not know, at this date, at least, a peace treaty still remains to be signed between our countries, and radio contact is not permitted. Since King Hussein was operating an English station, no "laws" were broken, of course.

You no doubt remember that many years ago the thaw in U.S./China relations began with the famous ping-pong diplomacy, wherein American and Chinese sportspeople met face to face in a table-tennis tournament. Could it be that ham radio will help ease the tensions in the Middle East? The people in this area are weary of hostilities, and it is our hope that very soon a New Age will dawn—not only here but on the entire face of our planet. As hams, we can play an important part, and we must always remember that we can be ambassadors of good will from our respective countries.

To sum up, Easter in the Holyland, 1987, was an overwhelming success. QSL cards for all contacts have already been sent out through the bureaus, and a special certificate is available to those who made contact with four of the five special stations. If this applies to you, send details of the contacts verified by two licensed hams along with six IRCs or equivalent to: Easter 87 Award, c/o POB 4099, Tel-Aviv 61040, Israel.

OTHER NEWS

• A new repeater has joined the Israel Amateur Radio Club network. On 145.600 MHz with input 600 kHz down, it is situated high in the Samarian Hills, giving good coverage of the coastal strip from Ashkelon in the south to Haifa up north. A 192.8-Hz tone is necessary to access it. The machine is helping to relieve the congestion from the Tel-Aviv repeater. Visitors are warmly welcomed to bring it up.

• I'm sorry to report that after almost 40 years of free licenses to visiting overseas amateurs, the Ministry of Communications is now charging our guests $10 for their reciprocal license. Otherwise the procedure remains the same as I have outlined in previous columns.

• A new callsign prefix has come into use: 4X1. This is to designate the Class A license, but present holders of the A ticket will not be forced to change their call. They may use any suffix available with a 4X1 prefix on a first-come-first-serve basis, and may continue to use their old call as long as QSLs for same remain in their possession.

Class B holders remain 4X4, 4X6, and 4Z4, while Class Cs (Novices) are 4Z9. The 4X8 prefix will be granted hams visiting from abroad who have rendered spe-

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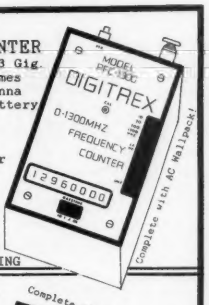

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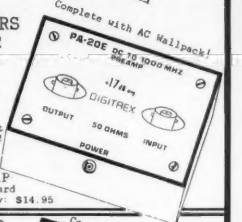

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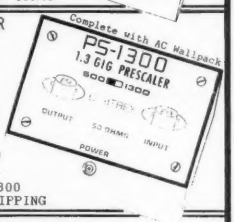

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cial services to the Israel Amateur Radio Club.

• Amir 4X6TT announces that he is starting an around-the-world jaunt for a year and intends to operate from as many countries as possible. He asks that you look out for him on the air—and don't be surprised if this young man shows up on your doorstep!

MEXICO

Mark Toutjian XE1MKT
Apartado Postal 42–048
06470 - Mexico, D.F.

SPANISH ANYONE?

If communication were nothing more than just learning a language, things would be much easier; all of us hams could unearth high school foreign language texts, turn our transceivers on, and begin chattering phrases in any language.

But it doesn't work that way. Look at the numbers of people who go to a foreign country—such as Mexico—right out of a formal Spanish course and find themselves faced with that frustrating stare that says so eloquently, *"What on earth are you trying to tell me?"*

But at least they make the effort. I've had a few QSOs with non-Spanish-speaking colleagues who froze up at the idea of repeating a few words in Spanish. I couldn't even get them to say *"hasta la vista"* or even a little *"adios"*!

Yet, I understand how they must feel. Although I "learned" Spanish in school back home (in the San Francisco Bay Area), it wasn't until I married Ruthy—a beautiful *senorita* from Mexico—ten years ago and moved to Mexico that I became fluent in the language. And, yes, over the years I have stuck my foot into my mouth more than once. But I am consoled by the thought that if people learn from their own mistakes, many are getting a fantastic education!

Fear of looking (or sounding) stupid chokes up many people. I had to learn to laugh at my mistakes—along with those who witnessed them. Yes, mastering a new language is educational in more than one sense.

But, as a ham radio operator, think of it this way: You don't have to move to a foreign country to learn *and become fluent in* the language of the land, whether it be Spanish or any other tongue. Whether you took a foreign language in school or you are just beginning to study it, your ham gear puts you in that foreign country and gives you the opportunity to *really* learn it.

Or even better: When you learn a new language (even just the basics), you open a door to millions with whom you probably never would have been able to communicate in your entire lifetime because of the language barrier. And who knows. . . there may be many lasting friendships out there waiting for you.

On the other hand, I know for a fact that most Spanish-speaking ham radio operators want to learn or improve their English. You could help them at the same time. So why not learn Spanish? Take fuller advantage of your equipment. And remember that no language is TOO hard to learn. If a baby can do it, so can you—*hasta pronto!*

[Ed. note: A Danish lass and I became first-name acquainted on the old Gripsholm *many years ago. Her name was Svea, or Svia, rhyming with Tina, so that's how I decided to remember it. Next day I saw her across the lounge and hailed her: "Hello Svina!" Well, that's phonetic spelling for svine, as in swine. . . but she forgave me with an amused smile. I forgave myself, but only after hours of agony. XE1MKT is absolutely correct—and most of the time the mistakes are really amusing. In Puerto Rico in 1940, I thought it funny that every movie theatre in San Juan was running the same show, "Hoy." In Germany I got lost because so many streets had the same name:* "Einbahnstrasse."*]* ■

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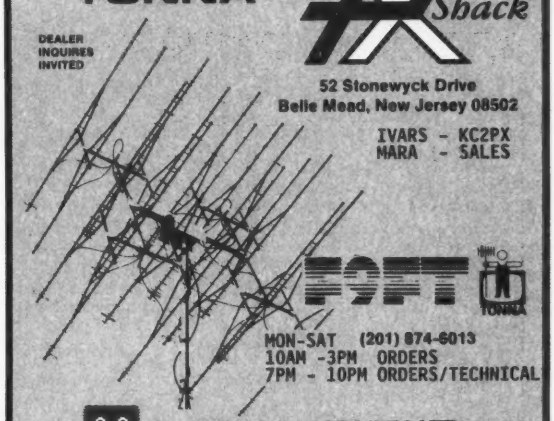

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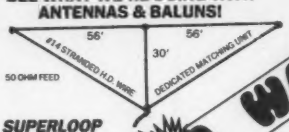

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Jim Gray W1XU

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GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7A	14	14	14	14
ARGENTINA	21	14	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	14	14	7A	7	7	7	7A	14	14	14	21	21
ENGLAND	14	7A	7	7	7	7A	14	14	14	14A	14A	14A
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7B	7B	7B	7B	7A	14	14	14	14	14
JAPAN	14	14	14B	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14
PHILIPPINES	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	7A	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	14	14	14	14A	14A	14	14
U. S. S. R.	7A	7	7	7	7	7B	14	14	14A	14A	14	14
WEST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

CENTRAL UNITED STATES TO:

ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14A	21A	21
ENGLAND	14	7A	7	7	7	7	7A	14	14	14	14A	14
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7A	7B	7B	7B	7B	7A	14	14	14	14
JAPAN	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	14	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14A	14	14
U. S. S. R.	7A	7	7	7	7	7B	14B	14	14A	14	14	14

WESTERN UNITED STATES TO:

ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7	7	7	14	21	21A	21A	21
AUSTRALIA	21A	14A	14	14	7A	7A	7	7	7	7B	14	21
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14	21A	21
ENGLAND	14	7A	7	7	7	7	7B	7A	14	14	14	14
HAWAII	21A	14A	14	14	7A	7	7	7	14	14	21	21
INDIA	14	14	14	7A	7B	7B	7B	7A	14	14	14	14
JAPAN	14A	14A	14	14	14B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14	14	14	14B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	7A	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	7B	14	14	14A	14	14
U. S. S. R.	7B	7B	7	7	7	7	7B	14B	14	14	14	14
EAST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

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AUGUST

SUN	MON	TUE	WED	THU	FRI	SAT
						1 G
2 G	3 F	4 G–F	5 G–F	6 G–F	7 G	8 G
9 G	10 G	11 G	12 G	13 G	14 G–F	15 F
16 F	17 F–G	18 F–G	19 G	20 G–F	21 F–P	22 P
23 P	24 P	25 P	26 P–F	27 F	28 F–G	29 G
30 G	31 G					

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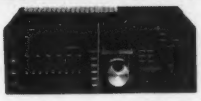

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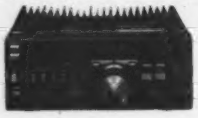

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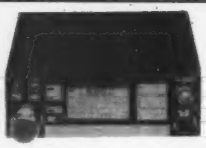

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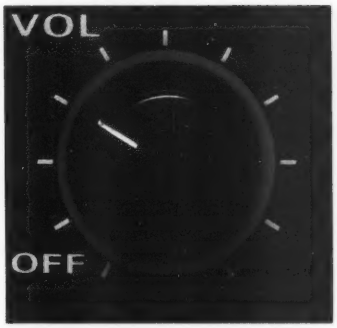

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In fact, if you own our hand-held FT-23R, you've already learned how to use our FT-211RH and FT-711RH. Because all three radios are based on the very same technology.

To begin with, you get an autodialer mic with 10 lithium backed memories, each capable of storing any key sequence up to 22 digits long.

Plus you get: 45 watts output (35 watts on 440 MHz). LCD readout. 10 memories that store frequency, offset and PL tone. (7 memories can store odd splits.) Scan all memories or selected memories at 2 frequencies per second. Band scan at 10 frequencies per second. Tx offset storage. Priority channel scan. Tuning via tuning knob, or up/down buttons. PL tone board (optional). PL display.

Independent PL memory per channel. PL encode *and* decode. LCD power output and "S"-meter display. Eight-key control pad. Keypad lock. High/low power switch (low power: 5 watts VHF, 3 watts UHF).

What's more, each radio is perfect for overhead mounting. Just remove a few screws and flip the control panel 180°.

Discover the 2-meter FT-211RH and 440-MHz FT-711RH at your nearest Yaesu dealer today. If you can turn a knob and push a button, you'll have high-performance mobile operation mastered.

YAESU

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. Repair Service: (213) 404-4884. Parts: (213) 404-4847
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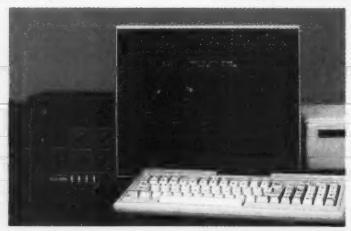
All New Compact HF!

"DX-citing!"

TS-440S Compact high performance HF transceiver with general coverage receiver

Kenwood's advanced digital know-how brings Amateurs world-wide "big-rig" performance in a compact package. We call it "Digital DX-citement"—that special feeling you get every time you turn the power on!

- **Covers All Amateur bands**
  General coverage receiver tunes from 100 kHz—30 MHz. Easily modified for HF MARS operation.
- **Direct keyboard entry of frequency**
- **All modes built-in**
  USB, LSB, CW, AM, FM, and AFSK. Mode selection is verified in Morse Code.
- **Built-in automatic antenna tuner (optional)**
  Covers 80-10 meters.
- **VS-1 voice synthesizer (optional)**
- **Superior receiver dynamic range**
  Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range. (500 Hz bandwidth on 20 m)
- **100% duty cycle transmitter**
  Super efficient cooling permits continuous key-down for periods exceeding one hour. RF input power is rated at 200 W PEP on SSB, 200 W DC on CW, AFSK, FM, and 110 W DC AM. (The PS-50 power supply is needed for continuous duty.)
- **Adjustable dial torque**
- **100 memory channels**
  Frequency and mode may be stored in 10 groups of 10 channels each. Split frequencies may be stored in 10 channels for repeater operation.
- **TU-8 CTCSS unit (optional)**
  Subtone is memorized when TU-8 is installed.
- **Superb interference reduction**
  IF shift, tuneable notch filter, noise blanker, all-mode squelch, RF attenuator, RIT/XIT, and optional filters fight QRM.
- **MC-43S UP/DOWN mic. included**
- **Computer interface port**



- **5 IF filter functions**
- **Dual SSB IF filtering**
  A built-in SSB filter is standard. When an optional SSB filter (YK-88S or YK-88SN) is installed, **dual** filtering is provided.
- **VOX, full or semi break-in CW**
- **AMTOR compatible**

Optional accessories:
• AT-440 internal auto. antenna tuner (80 m—10 m) • AT-250 external auto. tuner (160 m—10 m) • AT-130 compact mobile antenna tuner (160 m—10 m) • IF-232C/IC-10 level translator and modem IC kit • PS-50 heavy duty power supply • PS-430/PS-30 DC power supply • SP-430 external speaker • MB-430 mobile mounting bracket • YK-88C/88CN 500 Hz/270 Hz CW filters • YK-88S/88SN 2.4 kHz/1.8 kHz SSB filters • MC-60A/80/85 desk microphones • MC-55 (8P) mobile microphone • HS-5/6/7 headphones • SP-40/50B mobile speakers • MA-5/VP-1 HF 5 band mobile helical antenna and bumper mount • TL-922A 2 kw PEP linear amplifier • SM-220 station monitor • VS-1 voice synthesizer • SW-100A/200A/2000 SWR/power meters • TU-8 CTCSS tone unit • PG-2S extra DC cable.

Kenwood takes you from HF to OSCAR!

Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.

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